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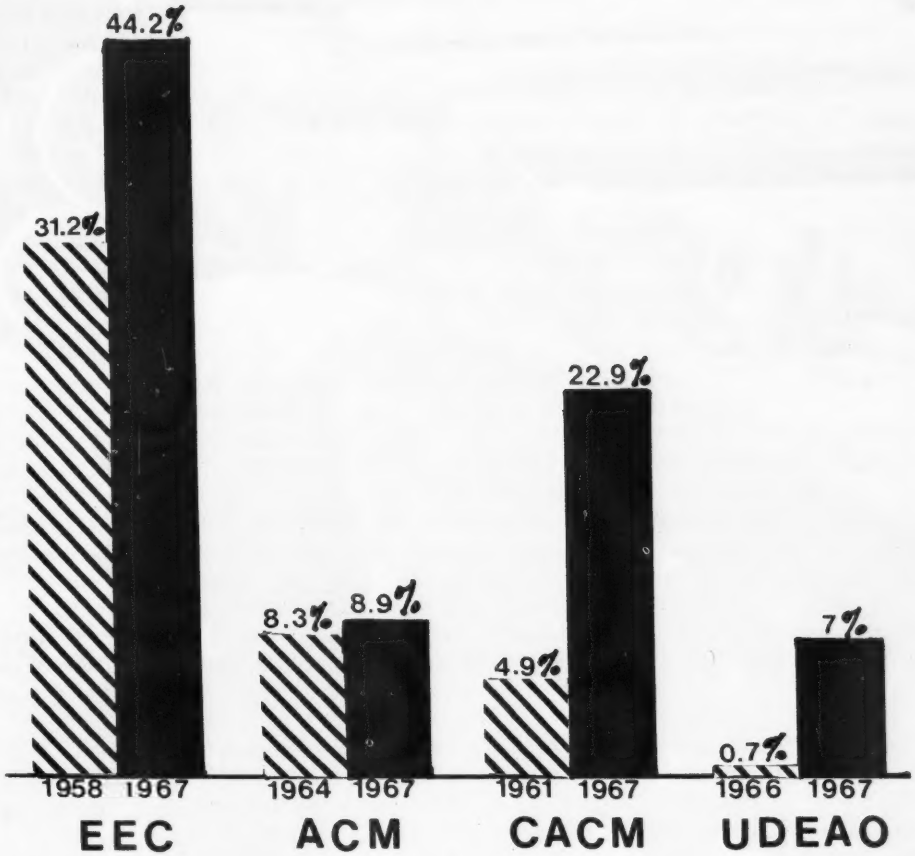
TRADE WITHIN FOUR REGIONAL GROUPINGS



REGIONAL INTEGRATION

THE BAR GRAPHS REFER TO PERCENTAGES OF THE TOTAL FOREIGN TRADE OF COUNTRIES IN REGIONAL ASSOCIATIONS THAT IS ACCOUNTED FOR BY TRADE WITHIN THE GROUP. (FOR TRADE FIGURES AND LISTS OF COUNTRIES WITHIN REGIONAL ASSOCIATIONS, SEE PAGES 5-6 BELOW.) IN THE BACKGROUND IS A PICTURE OF PRODUCTS IN INTRA-REGIONAL TRADE IN WEST AFRICA.
[PHOTO: UNITED NATIONS]

Trade Shifts in Regional Groupings

During the past 15 years a number of regional associations of countries have been formed all over the world. These groupings are very diverse, not only in the characteristics of the countries involved but in the nature of the associations they have created and the degrees of economic cooperation and effective integration that have resulted. Some of these associations were formed for political purposes only; most have some economic aims, but with much variation in the extent of what was attempted. Of those with economic purposes, some have been extremely significant for the economies of their member countries, while others have been nearly devoid of economic consequences. An interesting birdseye view of this global phenomenon in the 1958-67 decade is supplied by the trade figures in the table below. They compare 14 regional groupings of countries on four continents in the proportion of their foreign trade falling within the group, and the growth rates (by volume) for internal, external and total exports.

These trade measures may be taken as generalized indicators of more complex changes. The proportion of intra-group trade can be seen as showing degrees of de facto integration of the economies in these groups—that is, the extent of complementarity and interdependence in actual production patterns, given the relations of total trade to gross national product (GNP) values. This use of the word integration to reflect economic facts must be distinguished from other uses, for example the integration—i.e., coordination—of policies and planning. De facto integration of production in two or more countries may grow up through the exchange of goods without any special plans or policy intentions; conversely, elaborate cooperative schemes may not accomplish much if producers and consumers in the countries concerned find little to exchange.

If levels of integration in this de facto sense can be measured by trade figures, then the amount of increase in an intra-group trade proportion might be regarded as measuring the integrative impact of a regional association. However, this inference must be made with considerable caution. In the data below, most of the regional associations have dates for effective operation beginning after 1958, often closer to 1967; moves such as reduction of trade barriers among group members are usually scheduled to come in stages after the formal agreement, though in some cases they have preceded it; in any case, their consequences will develop after a time lag. Further, there are other causes for trade shifts that may be more important than the creation of a new association. The clearest case of this is the Asia and Pacific Council (ASPAC): the substantial increase in this intra-group trade stems largely from the dynamism within Japan

and the rapid expansion of Japanese trade with Asian neighbors; it owes nothing to ASPAC—created in 1966 as a vehicle for occasional, politically oriented consultations. Nevertheless, the fact of growing integration in this area is of interest; and in most other cases the relation of regional associations with intra-group trade shares is more meaningful.

Export growth rates are good indicators of developmental dynamism, at least in its outward-looking aspects which are always important for the smaller countries. Intra-group trade shares must be seen in conjunction with these growth rates; e.g., an increasing share might result only from a drop in external marketings. Comparison of internal (intra-group) with external export growth might be regarded as indicating how much the dynamism of the group derived from the stimulus of the group's association—again with the same caveats regarding cause and effect relations, and assuming that internal trade was large enough to be potentially significant.

There is a sharp contrast in trade figures of the European groupings with those of other continents. Starting with relatively high levels of internal trade, these groups of predominantly industrial countries expanded their trade generally, and in Western Europe increased their integration. EEC was clearly the most effective, but EFTA also moved in the same direction. The communist nations, despite the elaborate CMEA arrangements for regional planning (and the centralized economic controls within these countries), have maintained their very great interdependence at about the same level during their trade expansion.

Among the groupings of less industrialized countries (ASPAC, with Japan and other Asian states, is a mixed case), the Central American Common Market (CACM) stands out as a success story for economic integration in the period covered. The Latin American Free Trade Area (LAFTA), like the Arab Common Market (ACM), started with somewhat more internal trade than other groupings, but neither made much progress toward integration in the decade. (Figures for the Andean group, formed only in 1969, are included to show how little mutual trade they had to start from.) The other Asian and African groups all began with very small shares of intra-group trade; Malaysia-Thailand-Philippines (ASA) and the francophone countries of West Africa (UDEAO) increased their shares, though not to high levels, while other groupings stagnated or lost ground in this respect.

In sum, the most emphatic trade shifts indicative of regional integration during 1958-67 are found in Western Europe, Central America, and the Asian-Pacific area. The first two resulted from purposeful regional planning: the EEC story is well known; CACM experience, involving small countries, underdeveloped by Latin American

standards, is analyzed on pp. 7-21 below. Elsewhere, the paucity of pertinent trade shifts is not necessarily a proof of failure, which must be judged from the timing and nature of what was attempted; as noted above, some groups were largely political in intent, and others appeared too late in the decade for the results to show. Nor does it demonstrate a lack of future potential in the new and evolving efforts to develop regional cooperation.

Trade Characteristics of Regional Groupings of Countries, 1958-1967

(in percentages)

Regional Groups	Effective Dates of Associations	Percentage of Total Trade Within Group		Compound Export Growth Rate 1958-1967		
		1958	1967	Within Group	Outside Group	Total
Europe						
EEC	(1958)	31.2	44.2	15.2	8.3	10.8
EFTA	(1960)	18.2	24.7	10.7	6.0	7.0
CMEA	(1958)	56.2	58.8	9.4	8.1	8.9
Asia						
ASPAC	(1966)	17.1	25.0	16.3	10.3	11.5
ASA	(1961)	1.1	4.0	22.2	5.3	5.6
RCD	(1964)	1.0	1.7	14.8	8.5	8.6
ACM	(1964)	8.3	8.9	7.1	6.1	6.2
Africa						
PCCM	(1964)	4.3	1.0	-5.6	11.4	11.0
EACM	(1964)	0.6	0.2	-7.9	5.3	5.2
UDEAC	(1966)	1.4[a/]	0.5	-15.9[b/]	6.9[b/]	6.7[b/]
UDEAO	(1966)	0.7[a/]	7.0	30.4[b/]	9.0[b/]	10.0[b/]
Latin America						
LAFTA	(1961)	9.3	8.7	3.7	4.6	4.5
ANDES	(1969)	4.1	2.1	0.1	8.2	8.0
CACM	(1961)	4.9	22.9	27.9	5.2	7.7

a/ 1960 b/ 1963-1967

SOURCE: World Trade Flows, Integrational Structure and Conditional Forecast, Vol. II, Statistical Appendix, Table Series B, pp. 14-73. Center for Economic Research, Swiss Federal Institute of Technology, Research Monograph No. 5 (new series). Zurich: Schulthess Polygraphischer Verlag A.G., 1971.

Identification of Regional Groups

EEC - European Economic Community: Belgium, Luxembourg, France, West Germany, Italy, Netherlands

EFTA - European Free Trade Association: Austria, Denmark, Iceland, Norway, Portugal, Sweden, Switzerland, United Kingdom.

CMEA - Council for Mutual Economic Assistance: Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, USSR.

ASPAC - Asia and Pacific Council: Australia, New Zealand, Japan, Taiwan, South Korea, Malaysia, Philippines, Thailand.

ASA - Association of Southeast Asia: Malaysia, Philippines, Thailand. With the addition of Indonesia and Singapore in 1966, this group was renamed the Association of Southeast Asian Nations (ASEAN).

RCD - Regional Cooperation for Development: Iran, Pakistan, Turkey.

ACM - Arab Common Market: Iraq, Jordan, Lebanon, Syria, Yemen.

PCCM - Permanent Consultative Committee of the Maghreb: Algeria, Libya, Morocco, Tunisia.

EACM - East African Common Market: Kenya, Tanzania, Uganda.

UDEAC - Central African Customs and Economic Union: Cameroun, Central African Republic, Chad, Congo (Brazzaville), Gabon.

UDEAO - West African Customs Union: Dahomey, Ivory Coast, Mali, Mauritania, Niger, Senegal, Upper Volta.

LAFTA - Latin American Free Trade Association: Argentina, Brazil, Mexico, Paraguay, Uruguay, Venezuela, Bolivia, Chile, Colombia, Ecuador, Peru.

ANDES - Andean Common Market: Bolivia, Chile, Colombia, Ecuador, Peru.

CACM - Central American Common Market: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua.

The Central American Common Market

Donald H. McClelland

[After the five Central American countries formed their Common Market in 1961, they experienced an extraordinary growth in intra-regional trade and a rapid rise in industrial output. This growth resulted largely from the stimulus to local markets after intra-regional tariffs were abolished while external tariffs remained high, and it owed rather little to foreign investment or aid. While various difficulties are being encountered, and new policies will be needed to maintain growth, the achievements have been substantial.]

After more than a century of unsuccessful efforts at political union, five Central American countries—Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua—turned their attention in the 1950s toward economic integration. Having taken the bold decision in the early 1960s to create its Common Market, Central America moved within a few years from five economies of 2-5 million people each to what, in many respects, is a single economy of nearly 15 million. The General Treaty establishing the Central American Common Market (CACM) became partially operative in June 1961, with the ratification by three member states, followed by Honduras in 1962 and Costa Rica in 1963. Several regional institutions were established to promote a unified economy. These included the Central American Bank for Economic Integration (CABEI), the Central American Economic Council (composed of the Ministers of Economics), the CACM Executive Council, and the Permanent Secretariat for Central American Economic Integration (SIECA). Tariffs among member countries were abolished, and uniform external tariffs adopted. This analysis will concentrate on the early years, 1962 to 1966.

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Principal Trends Since 1950

Economic movement in Central America from 1950 through 1966 falls into three distinct periods. From 1950 through 1957—except for 1954, the worst crop year in the 18 year period—the gross national product (GNP) grew at rates of more than 5 percent each year; value of exports of coffee, bananas, and cotton each climbed steadily, with total exports growing at 6.5 percent per year. In 1958, however, there was a sharp reversal of trend. Over the period 1958-61, GNP growth dropped to 3.5 percent per year. Value of exports actually declined, reflecting drops in the prices of bananas and coffee by 15 and 20 percent, respectively, in 1958, a further fall in coffee prices of 18 percent in 1959, and a drop in cotton production. Beginning with 1962, the trends in all the main sectors (except government) moved upward (see Table 1). Exports outside the region resumed their upward climb at a rate considerably higher than in the 1951-57 period. Regional trade continued to grow even faster than in the previous period—at a rate of 36 percent per year—and reached a level where the absolute amounts as well as the rate of growth were impressive. Manufacturing moved from its rate of about 6 percent in the previous decade to nearly double that. Just as all of the forces had been adverse in the 1958-61 period, they now all became favorable in the period from 1962 through 1966.

Table 1: Trends in Major GNP Categories
Central America, 1950-66

	Annual Values (millions of dollars)[a]				Annual Rates of Change (percentages)		
	1950	1957	1961	1966	1950-57	1957-61	1961-66[b]
GNP[c]	1,788	2,496	2,886	4,110	5	3.5	6.5
Exports outside region	283	445	415	649	6.5	-1.5	9.5
Regional trade	8	17	37	174	11	22	36
Value added by manufacturing	221	340	411	626	6.5	5	11
Foodgrains	106	110	128	169	0.5	4.5	5.5
Commerce[d]	634	911	1,047	1,079	5	3.5	8[b]
Utilities, transport	80	144	172	319	8.5	4.5	8.5
Construction	52	95	78	104	9	-4	4
Government	92	151	190	236	7.5	6	2.5

a/ Data for 1950-61 at 1962 prices, for 1962-66 at 1965 prices.

b/ 1961-66 changes based on comparable AID figures for 1961. (For commerce, there was a large difference from the 1961 JPM figure which included services, see footnote d/.)

c/ GDP 1950-61.

d/ Including services through 1961, not in 1966.

SOURCE: Primarily, Central American Joint Planning Mission (JPM) through 1961, Agency for International Development (AID) for 1962-66.

In considering the relative importance of the GNP components shown in Table 1, it is clear that variations in export earnings, in-

cluding their indirect effects, have been a major element in variations in GNP growth throughout the period. Among the indirect effects of changes in exports, it seems reasonably clear that these changes have had a significant influence on changes in manufacturing. Manufacturing in turn, particularly during the Common Market period, appears to have been a leading sector; that is, to have had a definite expansionary effect on other sectors of the economy. The magnitude and/or amplitude of the changes in other sectors, along with their relation to the rest of the economy, indicate that they did not provide a major part of the dynamics in the economy. Commerce is a large sector but it tends to follow rather than lead, while the remaining sectors were relatively small.

Structural Changes Under the Common Market

Imports from the rest of the world. A high income elasticity of demand for imports from outside the region is evidenced by their increase of 11 percent per year during 1962-66, while the GNP was growing at less than 7 percent. There was surprisingly little change—even with the major increases in trade flows—in the relative proportions of the three largest import categories—manufactured consumer goods, industrial inputs, and agricultural inputs; increases were 54, 48 and 54 percent respectively. On the other hand, there were substantial shifts among the smaller categories (see Table 2). Turning to the breakdown of manufactured consumer goods into durables and non-durables, there is a sharp divergence in the two rates of increase. The relatively low increase in non-durables (pharmaceuticals were the only major category showing a large increase) suggests that import substitution was taking place mostly in the soft-goods category. Domestic production of such items as cosmetics, toiletries, shoes, and clothing had, in fact, increased substantially. For durables, the rapidly growing demand continued to be reflected in large increases in imports. Much of this increase was highly concentrated, with passenger cars, radios, and television sets accounting for more than half.

There also appears to have been considerable import substitution in certain industrial inputs. In the case of raw materials, where there was a relatively small increase in imports, much of the economy's increased demand was being supplied by domestic production of cotton, hides, and wood. On the other hand, imports increased rapidly in the processed raw materials category; the largest increases were in rayon and synthetic yarns and metal products for further processing. Import substitution is indicated again at the stage of intermediate goods, chiefly in cotton and synthetic cloth, galvanized sheets, nails, electric wire, etc. Virtually all capital goods, of course, continued to be imported.

The large increase in demand for imports came chiefly from three sources. A relatively small part (14 percent of the increase) came from increased inputs for agriculture, which probably had a more than equivalent effect on generating exports. About a quarter of the increase is attributable to equipment for transportation, construction, and public utilities—presumably the result of growth and the general process of modernization. The largest increases were in manufactured consumer goods and in industrial inputs used in large part for consumer goods. Thus, the major element in the balance-of-payments problem was the very rapid increase in the demand for manufactured consumer goods.

Table 2: Composition of Imports from Outside the Region, 1962 and 1966

(millions of dollars)

	1962	1966	Percent Increase
Manufactured Consumer Goods	97	149	54
Consumer soft goods	60	78	30
Consumer durable goods	37	71	92
Industrial Materials	120	170	42
Raw materials	7	9	30
Processed raw materials	26	46	77
Intermediate goods	87	115	32
Industrial Capital Goods	39	65	67
Agricultural Inputs	69	106	54
Other	177	281	--
Total Imports	502	771	54

SOURCE: SIECA, Anuarios Estadisticos.

Table 3: Central American Regional Trade, 1960-68

(millions of Central American pesos)*

Year	Amount	Annual Percent Increase	Ratio of Regional Trade to Imports from Outside the Region (in percent)
1960	32	16	7
1961	37	16	8
1962	50	35	10
1963	72	44	12
1964	106	47	16
1965	136	28	18
1966	174	28	23
1967	214	23	26
1968	258	21	33

*The Central American peso is an accounting unit equal to the U.S. dollar.

SOURCE: SIECA, Anuarios Estadisticos.

Regional trade. The truly spectacular growth in regional trade, by 250 percent in 1962-66 alone, is the most frequently noted phenomenon of the Common Market. The growth of trade within the region in 1960-68 is shown in Table 3. The increases in manufactured consumer goods, predominantly in non-durables, accounted for 41 percent of the total 1962-66 increase. Inputs for industry—especially yarn and cloth, and also certain metal products—increased much more rapidly

than consumer goods although the absolute increase was smaller (24 percent of the 1962-66 total). Regional trade in food nearly doubled in the same period.

The increased regional trade included a component of processed materials imported from outside the region, varying greatly by commodity. To that extent, the gains in trade may be regarded as overstated by the regional trade figures. Taking a weighted average of all the items, it appears that about one third of the value of goods moving in regional trade in 1966 was made up of imported raw materials, as compared with about one quarter in 1962. Thus, even on the basis of value added within the region, the growth of regional trade has been phenomenal.

Although the increase in trade within the region had a major effect on each of the five countries, that effect differed considerably, as shown in Table 4. The largest exports were those by El Salvador; by 1968, its exports to the other Central American countries amounted to two fifths of its total exports. Guatemala had the largest favorable trade balance. At the other end of the scale, Nicaragua had the largest deficit in both 1966 and 1968. While its exports to the region in 1968 were only 17 percent of its total exports, its imports from the region accounted for 25 percent of total imports. Its large trade deficits with the rest of Central America were particularly serious since it also had trade deficits with the rest of the world. Honduras had a Common Market trade deficit nearly as large as that of Nicaragua, but did have a nearly offsetting favorable balance with the rest of the world. For all the countries except Costa Rica, the surplus or deficit as a percent of exports did not change sharply between 1966 and 1968; but the absolute amounts were substantially greater. These data merely demonstrate what would be expected—that the growth in regional trade country by country was not equal. But the surpluses and deficits under the Common

Table 4: Regional Trade by Country, 1962, 1966 and 1968

(millions of Central American pesos)

	1962			1966			1968		
	Exports	Imports	Balance	Exports	Imports	Balance	Exports	Imports	Balance
Guatemala	13	11	2	52	34	18	77	49	28
El Salvador	18	22	-4	60	52	8	85	65	20
Honduras	14	9	5	20	33	-13	31	49	-18
Nicaragua	3	5	-2	16	31	-15	27	46	-18
Costa Rica	2	3	-1	26	24	2	38	49	-11

SOURCE: SIECA, Anuarios Estadisticos.

Market do not necessarily mean that some countries gained and others lost. Rather, it appears that all gained from the increased trade, although not by the same amount.

The industrial sector. The rapid growth of industry under the Common Market not only changed the structure of industry but appreciably altered the structure of the entire Central American economy. The contribution of manufacturing to the GNP is estimated to have increased from 12.8 percent in 1962 to 15.1 percent in 1966, an unusually rapid rate of change. Manufacturing industries have been classified as traditional, intermediate, or new. Traditional industries are defined as those that were already well established before the Common Market and that met a major portion of Central American demand. The main traditional industries are food, beverages and tobacco, wood and wood products, printing and publishing, and non-metallic minerals. Their value added by manufacture increased from $284 million in 1962 to $367 million in 1966. Although the category experienced the highest absolute increase in value added ($83 million out of $197 million for all manufacturing), its proportion of total value added fell substantially (from 70 to 61 percent). Intermediate industries are defined as those that were already large but where a major part of total demand was met by imports. Only two industries, both large ones, make up this category: textiles and clothing, and shoes. These have grown at a much more rapid rate, from $81 million to $150 million in value added, and have moved in the four years from one fifth of the manufacturing sector to one quarter. (A part of this increase was in essentially new industries, especially rayon cloth and knit synthetics.)

The new industries are those that were either small relative to total demand, or non-existent, before the Common Market. The most important new industries are paper, tires, metal products, chemicals, and plastics. (Petroleum refining is placed in a cetegory by itself.) Estimates for the new-industry category are the least satisfactory. Value added grew from $41 million to $87 million. Obviously not all these industries are altogether new; part of the base-year production is accounted for by industries that, taken as a whole, are best characterized as new but include traditional or intermediate sub-branches. Among the more important of the new products are prepared paints, medicines, perfumes and lotions, cosmetics, hair preparations, dentifrices, toilet soap, other soaps and detergents, shoe polish, fertilizer, tires and tubes, cardboard boxes, paper bags, galvanized sheets, metal pipes and tubes, machetes, flashlight batteries, electric wire and cable, light bulbs, phonograph records, and a wide variety of plastic products.

On the important question of increased employment in industry, there are no reliable data. Even if employment per unit of output

remained the same for each industry, which is unlikely, the contribution to increased employment in industry would have been at a slower rate than the growth of industry as a whole because of the less rapid growth of the more labor-intensive branches. Much of the industrial employment in Central America has been in artisan establishments; the 1962 Survey of Industry showed artisan employment at 211,000 compared to 150,000 factory workers. Although there are no subsequent data, it seems likely that increasing modernization of industry, particularly in such branches as shoes and clothing, has been partly at the expense of artisan establishments.

Changes in revenue structure. Government revenues in Central America showed a moderate upward trend from 1962 to 1966. Import duties as a percent of total central government tax revenue have fallen sharply from 51 to 33 percent. Even in absolute terms, import duty collections rose only slightly over the period, despite the sharp increase in imports from outside the region, and actually fell in the terminal year. The decline in duties as a percentage of imports from outside the region was substantial, from 23 percent in 1962 to 17 percent in 1966, but it is less than might have been expected. Moreover, more than half of this decline has been due to the tariff exemptions under the individual country fiscal-incentives programs. (Import duty collections from the same imports without the exemption would have fallen from 25 to 22 percent of import values.)

Growth Factors Related to the Common Market

External tariffs. The tariff schedules adopted by the CACM established uniform external tariffs for all the region for most commodities. Agreement on a preponderant number of items was reached in the basic agreement ratified in 1960 and the protocols of the next year or two. The process of setting these rates was one of consultation and negotiation, and the most usual uniform rate for individual items fell somewhere between the median and the highest of the previous rates of the five countries. In general, El Salvador had been the low tariff country; Costa Rica and Guatemala had had the higher tariffs. The overall effect is reported by one source to have been an increase in the average rate from 42 to 48 percent. The new schedules also changed the relationships among the types of goods imported. An Economic Commission for Latin America (ECLA) study concludes that while the average tariff on capital goods was increased only from 12 to 13 percent, and that on raw materials and intermediate goods from 30 to 34 percent, the average tariff on finished consumer goods was increased from 64 to 82 percent.

The levels of effective protection (pertinent tariffs as a percentage of value added within Central America) were generally high,

both before and after the CACM was created, on manufactured consumer goods. After the removal of intra-regional tariffs and the expansion of local markets, many of the products that appeared in intra-regional trade tended to be the cheaper goods in their respective lines. These were presumably of a quality or type suitable for low-income consumers in the area, though perhaps not for external markets (few manufactures have been exported outside the region). At the same time there were other products clearly selling above world prices, sheltered behind their tariffs; but it is difficult to generalize on their relative importance when there are so many gradations and shadings.

The Fiscal Incentives Programs to industry, carried out by the individual countries within the Common Market framework, were another device aimed at stimulating industrial output. The principal feature of these programs has been the exemption of tariff duties on imported current inputs—primarily raw materials—for industries meeting certain criteria of essentiality. Firms producing new products considered fundamental or essential were given tariff exemptions on all imports for ten years; for products considered less essential, the periods were shorter, and types of exemption fewer. In addition, all of the more essential producers were also extended exemptions from income taxes, generally for the same time period. Although evasion of personal income taxes is generally believed to be widespread in Central America, this has been much less the case for corporate income taxes; with maximum rates of 28 to 48 percent on corporate profits, the amounts can be sizable.

Individual countries were in a sense forced by the Common Market situation to use fiscal incentives more extensively than they would have done as separate economic entities in order to get income and employment benefits from new enterprises for themselves. Further, the competition between the countries in attracting an industry to themselves instead of their neighbors often occasioned the granting of larger sized incentives than would have been necessary merely to induce the industry to locate somewhere in the Common Market area. With these forces operative, the incentives have been widely employed by each of the countries. To give an indication, tariff exemptions under the Fiscal Incentives Programs in 1966 totaled $39 million, equal to nearly 1 percent of the GNP, 10 percent of central government tax revenues, and more than 30 percent of customs duties actually collected.

In assessing the effects of these fiscal incentives on the growth of industry, estimates are made only for the exemptions on raw materials: it is probable that nearly the whole effect is attributable to these exemptions. The total increase in industrial output from 1962 to 1966 that benefited from these tariff exemptions is estimated to

have been of the order of $160 million. The value added by manufacture for this increased output is estimated to be $58 million, roughly a quarter of the total increase in industry's contribution to the GNP growth. It seems reasonably clear that the vast preponderance of the savings to firms from the tariff exemptions went either to lower prices, high profits, or some combination of the two. No very precise estimate is possible, but it appears that the amount of value added that was actually dependent on the tariff exemptions for a reasonable level of profitability is of the order of only about $10 million [methodology omitted].

If an increase in fiscal-incentive tariff exemptions of $28 million (from $11 million in 1961 to $39 million in 1966) resulted in only $10 million of increased value added, then most of the incentives were wasted. These incentives were ineffectual partly because the level of incentives was determined largely by chance: in one wide range of cases, exemptions were too small to have been a major incentive; in another range of cases, they appear to have given considerably more than would have been needed. A more fundamental reason for their limited effectiveness was national competition. In 1969 a CACM convention on Uniform Fiscal Incentives was adopted, but this has not resulted in much change so far. The system offers the strongest incentives to production with the largest fraction of externally imported inputs where value added, i.e., the real contribution to CACM growth, is the least.

The System of Integration Industries was established to provide a means for dealing with industries where economies of scale are important. Its political objective was to foster "balanced growth" within the region by providing a reasonably even distribution among countries of the new, large-scale industries. The method employed is to give special protection to a single firm with "integration industry status" by giving it additional tariff protection and permitting it alone to market its product duty-free within the Common Market, with the preferred status being gradually eliminated over a period of ten years. The only "integration industry" actually operating in 1966 was the GINSA Tire Company in Guatemala; since then, several more have been started in Nicaragua and Honduras.

The Special System for the Promotion of Production was created to provide a less cumbersome alternative to the System of Integration Industries. The main element of the Special System is to grant higher levels of tariff protection for firms in new industries guaranteeing sufficient capacity to supply at least 50 percent of Central American demand. The first application of the Special System was made in April, 1965 for IPELCA, a Salvadoran company making electric light bulbs. Special System status has also been approved for firms making machetes, glass bottles for beverages, and several other products.

Each of the items covered by the integration-industry and special systems received very substantial increases in the nominal tariff rate. The estimated increase in production of these items in 1966 over 1962, when production was zero except for tires, is of the order of $10 million, with the bulk of it in tire production. Additional value added as a result of the two systems was at most $5 million. However, a comparison based on 1966 gives an understated impression of the potential importance of the systems, since these were only just beginning to take effect.

External assistance to the five Central American countries averaged 1.7 percent of the GNP in 1953-57, 2.0 percent in 1958-61, and 2.3 percent in 1962-66. Aid to Central America as a region in 1962-66 was an additional 0.45 percent. (These are commitment figures; disbursement figures would be somewhat lower.) Two aid-assisted programs merit consideration here: the Inter-American Highway, and the industrial loan programs of CABEI (see next paragraph). The geography and demography of Central America make highway transportation of great importance. The mountainous terrain in the most populous areas, the generally short hauls, and the fact that railroads in Central America were not developed as an interconnected system, set major limits on the efficient utilization of rail transport. The Central American portion of the Inter-American Highway was substantially complete as a paved highway by 1960. It connects four of the capital cities and, with short branch highways, the fifth capital city, as well as most of the other main population centers in Central America. It is abundantly clear that the enormous increase in regional trade in Central America, which is at the very heart of the integration movement, could not have taken place without it.

Investment sources. Estimates were made of total gross investment in manufacturing for 1962 through 1966. Admittedly rough, these indicate magnitudes of $80 million in 1962, increasing to something like $140 million by 1966. Foreign assistance available to CABEI for industrial capital loans totaled $82 million from 1961 through 1967. Actual disbursements, however, were less than $30 million from 1962 through 1966, with the bulk of it coming toward the end of the period. CABEI's industrial lending from foreign sources was thus on the order of 5 percent of the total.

The level of foreign private investment in Central America is difficult to ascertain. Gross foreign investment rose from 1962 to 1966, but interest payments and profit remittances may have risen faster. In any case, net investment appears to have been small, and may actually have been negative in 1965 and 1966. In manufacturing, gross foreign private investment showed a substantial increase. But the magnitude was still small, from about $1 million in 1962 to something more than $10 million in 1966. This investment was only rough-

ly 5 percent of gross fixed investment in manufacturing over the period, with much of it coming late enough to have had only a limited effect on production during the period. Much of the foreign industrial investment, however, was concentrated in the new industries. Even if net foreign private investment were negative, it may still have had an important positive effect on growth; the technical knowledge and specialized industrial and managerial experience that generally accompanied foreign investment may often have made a major contribution.

For manufacturing, therefore, it appears that some 85 to 90 percent of fixed capital formation was of Central American origin. And for the non-Central American sources of investment funds, which may well have had an overall effect beyond their proportion of the total because of catalytic effects, the increases appear to be predominantly a result of the Common Market itself.

"Balanced Growth"

In any integration of national economies, the countries involved will be affected in different ways. The concept of "balanced growth," as used in Central America, refers to equity in the distribution of economic gains and losses from the CACM among its members, in both the short and long run. It sets up goals for relative achievement among member countries, concerns itself with the dynamic as well as the more immediate effects of integration, and promotes explicit policies and actions to achieve balance. The ultimate goal is to equalize standards of living through more rapid growth in the poorer countries. This goal is achievable, if at all, only in the very long run and requires the completely free movement of capital and labor. The medium-term goal is to have growth in the less developed countries at least as rapid as in the others. The minimum requirement, in economic terms, is that each member country of the Common Market benefits over the long run from its membership.

The CACM was fortunate, in terms of political viability, in that the members were all at more nearly similar stages of economic development than is true of some proposed integration groupings. Per capita GNP estimates for 1962 showed Guatemala, El Salvador, and Nicaragua all in the range of $250 to $275, with Honduras somewhat lower at $217 and Costa Rica appreciably higher at $372. In the percentage contribution of industry to the GNP four of the countries were in the 12.5 to 14.0 percent range, and El Salvador's higher rate of 16.3 percent was due in part to greater limits on its agricultural expansion than in the other countries because of population pressures on its available land. By fairly common agreement, however, Honduras has been considered as definitely less developed than the others, with Nicaragua also considered as lagging somewhat behind, at least in industrialization.

In order to move toward balanced growth, the Common Market has taken various steps to give special preferences to the less developed members. This was a part of the basic rationale of the System of Integration Industries. Nicaragua got two of the first three industries with integration industry status and, as of this writing, it appears that Honduras will get the largest one (pulp and paper). Perhaps more important, the less advanced countries have received preferential treatment in the allocation of CABEI loans—particularly the road loans to Honduras from the Fund for Economic Integration. Also, the Protocol for Equalized Fiscal Incentives has responded to Honduras' request for preferential treatment. Whether such policies will enable Honduras and Nicaragua to catch up with the other countries remains to be seen, but their growth prospects certainly appear better within CACM than in isolation.

* As noted above, the minimum requirement in economic terms is that all members should, on balance, benefit. This is not, unfortunately, the minimum political requirement. For one thing, the benefits need to be visible and recognized, and even the assessment of benefits already realized has major elements of uncertainty. The projection of long-run economic benefits is even less certain. Political leaders are concerned with more than just economic considerations; and it is understandable that the leaders of the countries who feel they are benefiting the least will bargain strenuously, and perhaps take some risks, to get changes or preferential treatment [or even refuse to cooperate with the CACM—see comment at end].

While the political and long-run aspects are beyond the scope of this study, a few points can be made about short-run economic benefits in trade. Nicaragua seems to have been the worst affected in its payment balances (see Table 4 above). The Nicaraguan trade deficit with the Common Market was $15 million in 1966 and $18 million in 1968. The year 1967, however, showed an even greater deficit amounting to $24 million. This was particularly troublesome because at the same time Nicaragua was running a trade deficit of $28 million with the rest of the world. Cotton exports outside the region, which had shown a rapid, sustained increase with a high point of $67 million in 1965, dropped substantially in 1966 and even further in 1967.

But it would be incorrect to conclude that Nicaragua's regional trade deficit contributed proportionately to its total deficit, and it is not even certain that membership in the Common Market contributed at all to its overall trade deficit. Of the increase in Nicaraguan exports to the Common Market from $2 million in 1961 to $18.5 million in 1967, all but about $3.5 million was in items that were exported only to other Central American countries. That is, some $13 million of exports (the net amount would be less since some of them had a sizable import component) appear to have been

due to the effects of the Common Market and, without it, would probably not have been foreign exchange earners at all. On the other hand, much of the demand that was met by imports of $42 million from the Common Market partners would presumably have existed whether there had been a Common Market or not. Just how much is not clear; the CACM-induced growth added somewhat to the total demand for imports. In addition, some of the demand met by Common Market partners would, in the absence of the CACM-induced specialization, have been met, instead, by Nicaraguan production. It is not practicable to quantify these factors. But even allowing for them, it is at least possible that Nicaragua's total trade deficit might, even in 1967, have been greater had there been no Common Market.

Policy Choices for the Future

The general conclusion of this study is that the commercial-industrial policies pursued under the Central American Common Market have had very favorable effects on economic development. One might well ask: why not just continue them? There are several reasons why some change in emphasis should be seriously considered. First, even though the overall economic effects of the CACM were favorable, some changes could probably have made them more so. Second, the option of just having more of the same is not open. The easiest import substitutions have already been made. Further heavy emphasis on import substitution may be expected increasingly to encounter technological and other limitations, and the ratio between competitive or nearly competitive import substitution and high-cost import substitution may be expected progressively to worsen. Third, the mere extension of present policies will plainly not provide solutions to two critical problems: the balance-of-payments deficits, and the need for additional employment.

The balance-of-payments problem is almost certain to be a continuing one. As shown above, all major categories of external imports increased substantially in the period covered. Much of the increase was in essential consumer goods and in materials and equipment necessary to develop the economy, but a major part of the increase was in non-essential consumer goods, or in the machinery and materials to manufacture them. A sizable part of the rapidly growing demand for imports comes from the consumer demand of the upper-middle- and high-income groups. This suggests that a major element in dealing with foreign exchange shortages would be to make these goods more expensive, which would somewhat reduce their importation, whatever the elasticity of demand. This could fairly readily be done for many products by high excise taxes. Higher tariffs could also achieve this purpose but they run the risk of inducing undesirable import substitution. Balance-of-payments

difficulties led to the imposition of a 30-percent surcharge on all imports for a five-year period starting in 1969. Such a measure should be considered a stopgap; if the basic problem still persists at the end of five years, as seems likely, a more careful restructuring of the tariff system and appropriate exchange rate adjustments will be called for. A real long-run solution to the balance-of-payments problem will necessarily include a major diversification and expansion of exports. The difficulties may well be great, but for an economy the size of Central America there is no solution without it.

The System of Integration Industries, and the Special System, are implemented by augumenting the existing tariff levels which opens the way to high-cost, inefficient production. The Integration System was aimed at the creation of a single firm for industries where economies of scale are important, as large as the size of the market warranted. The problem, of course, is the dangers inherent in the creation of a monopoly. Certain safeguards with respect to quantity and quality are written into the agreement for each industry, but these are not easy kinds of requirements to administer. The Special System avoids the problem of monopolies by permitting several firms to combine in meeting the requirement of being able to supply at least half of the market and by permitting, also, the subsequent free entry of additional firms on the same terms. But, in doing so, it encounters the other horn of the dilemma—the risk of firms of uneconomic size or with excess capacity.

At least a partial solution to the dilemma is suggested by the experience to date. Much greater reliance should be placed than was originally contemplated on competition from outside the region as a safeguard against excessive prices. If tariffs are set to provide only "reasonable" levels of protection, there need be no special, cumbersome procedures to ensure that the quantity and quality of integration industries are adequate or that prices are not "too high." This approach could accommodate reasonable needs for "infant industries" by fiscal-incentive exemptions with a preestablished phase-down schedule. It is important that the phase-down be set in advance and that it be adhered to, otherwise the reductions in protection would become a penalty for efficiency—scarcely a sound principle for an incentives system.

Central America is reaching a time of decision. The favorable growth experience of the 1960s was due chiefly to the widening of the market inherent in the creation of the CACM. Most of the special incentives have played a relatively minor role, mostly in the import- and capital-intensive industries. Most of the "easy" opportunities have probably already been utilized, although some others may still exist. Further new import substitution on a large-scale, "forced-draft" basis, however, would almost certainly be predominantly high-

cost, and inefficient by international standards. Central America should try to move away from the high-cost, low-return phase of import substitution, so often found in South America and elsewhere. The choice of an outward-looking development strategy stressing exports outside the area would be completely obvious if the world markets for new products from the developing countries were not so intensely competitive and if there were assurance that these markets will be rapidly growing. The competitiveness does exist; however, a policy looking toward entering new international markets seems to be the most promising route to continuing growth.

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[EDITORIAL NOTE: Since this book was written, Honduras has re-imposed duties on imports from CACM members; Costa Rica terminated its exchange rate preference given to CACM imports; and some have feared that the CACM gains may be in jeopardy. The increases in intra-regional trade have almost ceased since 1969. But despite continuing political tensions and uncertainties, most of the Common Market arrangements remain in effect. Whatever the future may bring, this analysis of the past impact of the CACM seems an important contribution to understanding the potentials in regional cooperation.]

Regional Economic Cooperation in West Africa

Adebayo Adedeji

[The need for regional economic integration has been appreciated by many African leaders since their countries became independent early in the 1960s, but they did not always sufficiently distinguish economic and political unity, and little has been achieved and consolidated in either field. If positive results are to be obtained in West Africa in the 1970s, the old doctrinaire attitude must give way to a more pragmatic approach, which neither demands political union as a precondition for economic integration nor takes an all-or-nothing attitude to the latter.]

West Africa is not a precise geographical expression, and has no generally accepted definition. Fourteen countries have attended a series of regional meetings on economic cooperation in West Africa, and it is the governments of these same countries that have been negotiating a treaty for the establishment of the Economic Community of West Africa. In this article, therefore, we will mean by West Africa these 14 nations: Dahomey, Gambia, Ghana, Guinea, the Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo, and Upper Volta. These countries are quite different in size and level of development: 60 percent of the region's population are Nigerians; Nigeria and Ghana together account for nearly two thirds of the regional gross domestic product (GDP) and population.

A principal obstacle to economic integration in this region is that the West African national economies are competitive, in the sense that many of them produce

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the same range of primary products. Their economic structures are not potentially complementary in the short run, i.e., the removal of barriers between these countries is unlikely to induce replacement of high-cost domestic production by lower-cost supplies from other members of the customs union; the generally low level of industrialization rules out major adjustments of this kind. The countries are foreign-trade oriented, but only a small proportion of the external trade of each is within the region. In 1965/66, for example, imports of the 14 West African countries from each other were only 3.3 percent of their total imports; indeed, imports from all of Africa were only 5.5 percent of this total. The arguments for a customs union in West Africa, therefore, rest primarily on the stimulus which such unions might give to the creation of new productive capacity rather than to the more efficient utilization of existing resources.

Existing Economic Groups and Associations

The French West African colonies were closely linked in the colonial era, and were administered as one large economic unit. There were virtually no formal links among the British territories, which were geographically separated from each other. French West Africa disintegrated when the eight countries were given independence separately. To arrest this post-independence fragmentation, the West African Customs Union (UDAO) was established in 1959 by the Ivory Coast, Senegal, Dahomey, Mauritania, Niger, Mali, and Upper Volta. Unfortunately, the Union failed due to: i) the widely differing levels of development of the countries; ii) the tendency of new economic growth to concentrate in the more advanced countries; iii) the practical difficulties of coordinating investment policies and redistributing the gains from the union through inter-country payments; and iv) political problems which inhibited economic cooperation. The Union was re-activated in 1966 by a new convention, which permits members to impose tariffs in order to protect infant industries.

Four member countries of UDAO—the Ivory Coast, Upper Volta, Niger and Dahomey—in 1959 established the Conseil de l'Entente, a political and economic group which provides for the eventual establishment of a customs union. As a French jurist has put it, the Entente "was never intended to be a federated state, but merely a cooperative association intended to give a practical form to economic solidarity and to establish the common utilization of certain public services." Only certain services are jointly managed: the Cotonou and Abidjan harbors, and the Niger-Benin and Abidjan-Niger railway lines. The four states also established a "solidarity fund:" each state pays into this one tenth of its budgetary receipts, and the proceeds are redistributed, so that one sixteenth goes to the rich Ivory Coast and five sixteenths to each of the other three less affluent

states. The Entente has survived, in spite of difficulties, because it was based on the realistic assumption that a union should not require African states to relinquish any of their sovereignty. Its success has attracted a fifth state, Togo, which joined in June 1966. Since then, the purpose of the solidarity fund has been changed to that of assisting member countries and guaranteeing their borrowing. The fund is to receive 650 million CFA francs annually: 500 million from the Ivory Coast, 42 million each from Niger, Upper Volta, and Dahomey, and 24 million from Togo. The Ivory Coast will not draw on the fund during its first five years in order to make possible the maximum assistance to the investment programs of the other members.

In the financial field, the former French West African Currency Union was replaced in 1962 by the West African Monetary Union; the CFA franc has been convertible into French francs since its introduction, and in 1967 it became convertible into other currencies for current payments. CFA francs are used in the former French colonies except Guinea and Mali, which established their own currencies. Liberia uses the U.S. dollar as legal tender. Whereas most of the francophone countries retained a common currency, the former British dependencies established separate central banks at the attainment of independence and replaced their common West African pound by national currencies. West African Airways, which had operated air services between the four anglophone countries, was disbanded in favor of national airways for Ghana and Nigeria. National research institutions replaced those established by the British to serve the four dependencies.

One striking feature of the past decade has been the inability of the anglophone and francophone West African countries to break the language and cultural barriers and to form effective economic groupings which cut across them. The few attempts made were far less successful than the efforts made among the francophone countries. Thus the Ghana-Upper Volta and the Ghana-Guinea experiments of 1961 came to nothing, as did the discussions on the economic integration of Senegal and the Gambia, begun in 1963. A West African free trade area initiated in 1964 between the Ivory Coast, Guinea, Liberia, and Sierra Leone has also borne no fruit.

In spite of these failures to form effective small economic groupings, efforts have been initiated to form an economic community for all 14 West African countries. In October 1966 their representatives met in Niamey to consider the draft articles of association for such a community. Its aims were to be: a) to promote through economic cooperation a coordinated development of the member states in industry, agriculture, transport and communications; b) to maximize trade between its member states and to eliminate progressively customs and other barriers to such trade as well as restrictions on

current payment transactions and on capital movements; c) to contribute to the orderly expansion of trade between the member states and the rest of the world, to take measures which render their products competitive with goods from outside the Community, and to seek more favorable conditions for their products in the world market; and d) by all these efforts to make a full contribution to the development of Africa as a whole. The Niamey meeting was followed by three others, in Accra (April 1967), Dakar (November 1967), and Monrovia (April 1968). At the Monrovia meeting, which was attended by heads of state, Nigeria and Guinea were requested to undertake priority studies of areas of cooperation in West Africa. This attempt to establish an economic community embracing all the countries of West Africa is the most ambitious so far.

Lessons of Experience

The first and perhaps most important lesson from the experience of the past ten years is that the all-or-nothing approach to economic cooperation in West Africa is most unlikely to succeed. There are too many countries involved and too many competing interests to attempt an all-embracing effort. Every country wants to establish new import-substituting industries to save foreign exchange and to create new employment opportunities. Every nation wishes to have its textile mill and its cement factory: this is the beginning of the industrialization process, when market size and the economies of scale are less important. At this point the manufacturing sector produces only 5 percent of the GDP of these countries, and large-scale production is still a rarity. Of course, every effort should be made to ensure a rational development of industry in West Africa. As more and more resources are devoted to industry, a coordinated regional approach to industrial development, particularly in intermediate and capital goods, will be increasingly needed, to overcome the inhibitions of small national markets. But such unity of action requires a high level of cooperation, greater than anything approached so far. This cooperation is further complicated by the unequal distribution of population and resources; Nigeria's size and indeed that of Ghana make both countries suspect among the small states of the region.

Another important lesson of the past decade's effort at regional cooperation in West Africa is the need for the countries concerned to establish firmly their economic independence before becoming associated with other neighboring countries. During the colonial regime, the main objective of France's economic policy was to integrate dependent economies with its own. This approach led to what Barbara Ward Jackson has called a kind of "economic closed circuit" between France and her dependencies:

All the colonies were part of a single monetary system—the franc zone—in which the local African franc was convertible into the French franc and had behind it the entire resources of the French Treasury. No territory had to worry with the problem either of financing imports or of balancing local expenditures against local receipts. French francs provided much of the capital and, when recurrent costs rose, France covered part of the local budgetary deficits as well. In addition tropical products had guaranteed markets in France at prices which were often above the world price level.

This was in contrast to developments in British Africa, where the colonial policy of eventual self government meant that no attempt was made to establish a centralized economic system controlled by Britain. Each country had to balance its own books and cover its own expenditure. They were allowed to trade with the rest of the world and build up their own external reserves. To be sure, there was a high concentration of trade to and from the United Kingdom, and their external reserves were held in sterling. But, on the attainment of independence, almost all the former British colonies were able to increase their trade with other countries and reduce the proportion of trade with Britain.

Since independence, the association of francophone countries with the European Economic Community not only seems to have strengthened the hold of France on their economies, but has led them to oppose the admission of other African states to EEC associate status. Their governments have been pressing for even more exclusive advantages, and are reluctant to water down the very real gains they derive from trade discrimination by admitting other African competitors to the charmed circle. Yet these same leaders have been meeting to agree with the anglophone countries on the need for a West African economic community. The Yaounde Convention of 1963 [on their association with EEC] does permit economic or customs unions between associate and non-associate African countries if not "incompatible with the principles or provisions of the convention," but France has been most reluctant to take a permissive view of this clause.

Yet another lesson from the experience of the 1960s is that, unless there is political goodwill among the countries of the region, cooperation will be difficult. Relations among the West African leaders were far from cordial in the 1960s and are not warm even now. This lack of political goodwill does not necessarily correspond with the cultural and language barriers, though it is often exacerbated by them. There can be no effective economic cooperation, nor any other kind for that matter, if the political leaders of the countries concerned are hardly on speaking terms.

Prospects for the Future

In the light of this experience, what are the prospects for regional cooperation in West Africa? The answer to this question, of course,

depends on the type of cooperation envisaged. If, as advocated here, the all-or-nothing approach is dropped in favor of functional, pragmatic progress, the 1970s may see a solid foundation laid for full integration. The formation of the European Economic Community was preceded by a number of cooperative endeavors, such as the Iron and Steel Community, the Coal Community, the Benelux customs union, and so on. It is most unrealistic to assume that effective economic integration can take place abruptly without a period of gestation. Instead of attempting to establish a full region-wide economic community or common market covering all the 14 countries of West Africa, vigorous efforts should be made to: a) provide regional infrastructure; b) harmonize monetary systems; c) facilitate the inter-regional flow of resources; d) promote intra-regional trade; and e) encourage groups of countries within the region to experiment with more integrated and sophisticated forms of economic cooperation, provided these are not inconsistent with the overall long-term interests of the whole region.

The need for a network of interstate roads in West Africa was realized and expressed in resolutions adopted by regional conferences held in 1960 and 1961. Unfortunately the actual road building has made very little progress. Only seven of the 14 link roads mentioned by the conference as the necessary basis for a regional network have been completed or are under construction. These include the routes from Yola to Caroua, Maiduguri-Fort Lamy, Kano-Sokoto-Birnin, Kabi-Kaya, Accra-Bamako, and Freetown-Bo-Zimi. Although the ECA secretariat has been active in standardizing road legislation and highway signals and making detailed road studies, little has been done in the countries concerned. It is essential that renewed efforts should be made. A regional network of railways is also desirable, but here there are technical and economic difficulties. The technical problem is the difference between the gauges of the existing national networks. The economic problem arises from the high cost of constructing new lines, as well as altering the gauge of tracks and/or vehicles. Unless the railways can compete with road haulage and pay their way, they will become a serious burden on the economy of the region.

In the whole of the African continent today there are no less than 50 airlines, while the more developed American continent is served by 40. As a result of excessive competition, the African airlines operate non-paying flights over many routes, with an uneconomically low load and high expenses per unit of traffic carried. In West Africa, the operating costs per passenger-kilometer or cargo ton-kilometer are generally about 30 percent above the world level. Air Afrique, which commenced operations in 1963, is jointly owned by francophone African countries and French interests. About three years ago, Nigeria and Ghana decided to pool their resources again

to run flights in West Africa. But more is needed. The eventual setting up of a Pan African Airways, to take over from the existing national and subregional airways all international flights inside and outside Africa, would reduce operating costs considerably. In the meantime, a new West African Airways should be set up to absorb Air Afrique and all the anglophone airlines.

Immediate action is also required in the monetary field. The setting up of a payments union among African countries was recommended as far back as 1964 by an expert group which met in Tangier, Morocco. The experts, noting the existence of a number of monetary unions in Africa, suggested that their amalgamation and extension on a continental scale could play "a crucial role in facilitating the flow of payments, the growth of intra-African trade and the strengthening of the African economies." The experts also agreed that a union for the clearing of payments among African countries should be set up in the near future to carry out the following functions: a) As regards trade with non-members, each member country would be allowed to exchange convertible currencies earned or accumulated by it for other foreign currencies needed for payment. This would facilitate offsetting, for instance, the sterling surpluses and French franc deficits of some countries with the sterling deficits and franc surpluses of other members. b) As regards trade among African countries or monetary areas, any member could be credited by the union with its convertible currency claims on another member, and these credits could be used to settle any convertible currency debt incurred towards another member. There is indeed an urgent need to institute some payments arrangement in West Africa; without free convertibility of the currencies in this region, at least among themselves, all talks about promoting intra-African trade will remain a pipe dream. Rigid national exchange control laws have considerably hindered intra-West African trade, particularly during the past five years. Unless positive steps are taken, intra-West African trade may diminish rather than increase between the two major currency areas.

A third form of cooperation, closely linked with the problem of convertibility, is to facilitate the free flow of resources within the region. Capital and labor moved more freely from one country to another within the region during the colonial era than they now do. Thousands of West Africans lived and worked in countries other than their own for years and moved their property when they migrated. But within the past few years there have been open discriminatory policies and practices against West Africans in some countries, where they are debarred from pursuing certain activities, while immigration from neighboring countries is becoming increasingly difficult. If there is going to be greater economic cooperation in West Africa, the domestic economic policies of the countries concerned must be consistent with this overall objective. No govern-

ment will want to enter into any effective cooperative arrangement with another that discriminates against its citizens resident in that country.

Discriminatory economic policies, inconvertible currencies, and the absence of adequate transport and communications systems all hinder trade. In addition to all these restrictions are import quotas and tariff barriers applied by all countries in the region. Whatever the precise form of any agreement, all countries should aim at progressive liberalization of their trade. Although the arguments for this have tended to concentrate on industrial goods, it is the liberalization of trade in agricultural produce that seems likely to be easier and more immediately fruitful. In the production of food crops, West African countries could be more interdependent. Indeed, some of them are already importing food from Europe and North America which could be supplied by neighboring countries. It is therefore suggested that the agricultural produce of the region, except for the major export products such as cocoa, groundnuts, coffee and palm oil, should move freely within the region without any barrier. This will give a fillip to the modernization of food crop production.

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Dilemmas of the Latin American Free Trade Association

John W. Sloan

[The Latin American Free Trade Association, formed in 1961 by a treaty designed to create a free trade area by 1973, has shown far less progress toward that goal than was planned. Regional integration remains the best hope for economic progress, but a stronger commitment of member nations to regional goals is needed; some proposals are offered.]

It is now recognized that only a few of the 100 underdeveloped countries in the world have a reasonable opportunity to achieve development through national effort alone. Today the most promising strategy for overcoming underdevelopment is regional integration, sometimes termed developmental regionalism, which refers to the joint policies of economic cooperation, coordination, and integration among underdeveloped countries designed to accelerate the rate of development of both the member states and the geographical region. Hopefully, developmental regionalism would provide the expanded markets and the efficient use of limited resources necessary for economic growth.

Economic integration has a different emphasis in the Third World than it has in such developed regions as Western Europe. In the European Economic Community (EEC), the principal economic goal is to aid the development of already established industries in highly industrialized countries through trade expansion. Economic integration among the developing nations is designed not only to expand trade, but also to create new industries, to help diversify national

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economies, and to increase the region's bargaining power with the developed world. A successful integration program for developing countries cannot be achieved by "negative integration," that is, the elimination of trade barriers. Where underdeveloped countries produce similar products—mostly primary goods—they cannot significantly increase trade among themselves until their economies undergo dynamic transformation. Regions of the Third World need "positive integration;" that is, they require the formation and application of coordinated common policies to achieve developmental objectives. Underdeveloped regions need to agree on such policies as a common external tariff, a regional policy toward foreign private investment, and a regional transportation policy. In short, positive integration is far more necessary to economic integration policies in the Third World than in the developed regions where industrial momentum and specialization are already advanced.

The Latin American Free Trade Association (LAFTA)

Latin America is the most developed region of the Third World. Many of the Latin American nations have pursued policies of import substitution which have resulted in a duplicative, light industrial development in most of the countries. However, most of the foreign exchange is earned through the sale of primary goods to the developed world. Since colonial times, Latin American nations have been neither the principal suppliers nor the principal markets for each other. When, in the late 1950s, the strategy of import substitution began to display diminishing rewards for its most advanced practitioners (Argentina, Brazil, and Chile), LAFTA was created to provide a new means of accelerated economic development. Established by the Treaty of Montevideo, LAFTA was negotiated in 1960 and ratified during 1961 by Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, and Uruguay. It has since been joined by Bolivia (1966) and Venezuela (1967).

The LAFTA treaty contains three basic agreements. The first requires trade liberalization by eliminating, over a 12-year period, barriers restricting intra-regional trade. To this end, each country, after negotiations with other Association members, establishes for each year a National Schedule which lists the products granted tariff reductions. These reductions are made in such a way that the average duty on all imports from other Association members is reduced with respect to similar imports from outside the area to the extent of 8 percent annually, thus increasing the margin of preference. The aim of the National Schedules is to attain a steadily widening margin of tariff preference for LAFTA nations. Furthermore, every three years all member countries must unanimously agree to a Common Schedule. The products included within the

schedule will be completely duty-free after 12 years, although there is no obligation to make any reduction during this period; they may or may not be in the National Schedules of the members at the time the schedule is agreed upon. This Common Schedule must include 25 percent of existing trade after the first three years of the treaty's operation, 50 percent of existing trade after six years, 75 percent after nine years, and essentially all trade within the area at the end of the 12-year period (1973).

The second agreement calls for the establishment of industrial "complementation agreements" for zonal industries. Such agreements allow two or more member countries to establish immediate free trade for a specific product or group of products. The third agreement requires preferential treatment for the region's less developed nations (Paraguay, Bolivia, and Ecuador).

None of the LAFTA institutions has even a hint of the supra-national authority that seems necessary to promote positive integration, i.e., the ability to establish and carry out area-wide policies and plans. Any decision made by any of them can be vetoed by a single nation's vote. LAFTA institutions were primarily designed to achieve tariff reductions (negative integration) rather than the positive integration that economists advocate for an underdeveloped region. The absence of supra-national powers, however, has not prevented LAFTA from attaining a number of noteworthy achievements. On the basis of annual item-by-item negotiations between 1962 and 1969, the Conference of Contracting Parties secured well over 11,000 trade concessions between members covering over 3,000 products. These tariff reductions helped intra-zonal commerce to increase from $660 million in 1961 to $2,432 million in 1969. Second, 16 complementation agreements have been signed, representing a total of 698 tariff reductions on 691 products. These include statistical and accounting machines, electronic tubes, electrical household appliances, petro-chemical products, glass products, and pharmaceuticals. Third, at least one study indicates that, except for Bolivia, Paraguay, and Venezuela, LAFTA members are exporting a higher proportion of manufactured goods to one another than to non-member countries. Fourth, to promote the equitable development of the continent, a number of special privileges—such as 7,000 exclusive trade concessions—have been granted to the less developed countries.

The significance of these accomplishments is reduced, however, when other factors are considered. In the same year that the American presidents promised cooperation toward establishing a common market, LAFTA failed to reach agreement on the second stage of the Common Schedule. According to Article 7 of the Montevideo treaty, the second Common Schedule, composed of goods amounting to 50 per-

cent of the value of intra-LAFTA commerce in the years 1964-66, was to have been agreed upon in 1967, but was not. In 1968, two additional meetings were held to reach some kind of compromise, but again both failed. As a result of the failure to fulfill the requirements of Article 7 and a growing dissatisfaction with the progress of LAFTA, the members decided to modify the Montevideo treaty. In 1969 Resolution 261 (IX), popularly known as the Caracas Protocol, was adopted, with these principal provisions: a) The period fixed to attain free trade was extended to December 31, 1980. b) The Permanent Executive Committee was given until December 31, 1973 to conduct the studies called for in the Montevideo Treaty "to create propitious conditions for the establishment of a Latin American common market." c) The members agreed, on the basis of these studies, to initiate in 1974 negotiations "aimed at the best possible fulfillment of the Treaty's objectives and, should the occasion be favorable, its adaptation to a new stage of economic integration." d) A five-year period ending December 31, 1974 was fixed to permit the members to establish new norms governing the Common List and to revise the previously agreed liberalization system by National Lists. Until such norms are established, the fulfillment of the Common List commitment was suspended for at least five years. e) From 1970 until the new National List system goes into effect, each member must grant the other members yearly tariff reductions equivalent to at least 2.9 percent of the mean fixed for duties now applied to third countries. In short, the members of LAFTA failed to live up to their Montevideo treaty commitments; essentially, the Caracas Protocol is a retreat to the early, planning stages of economic integration.

The initial increase in intra-zonal commerce has slowed down percentagewise in the past few years and now stands at 11 percent of total Latin American imports and exports, approximately the same as it was in the mid-1950s. Of this commerce, 90 percent continues to be composed of primary products, leaving only 10 percent of manufactured goods; and three quarters of intra-zonal commerce continues to take place among the traditional pre-LAFTA trading partners—Argentina, Brazil, and Chile.

Further, neither the complementation agreements nor the preferential concessions have aided the less developed nations. The complementation agreements have benefited the more advanced nations, chiefly Argentina, Brazil, Chile, and Mexico, and foreign firms. Bolivia, Ecuador, and Paraguay have not been able to take advantage of the 7,000 trade concessions granted exclusively to them because of their extremely limited ability to promote investments and to increase production and exportation of goods receiving preferential trade treatment. All of this has led the smaller countries, and even some of the medium-sized nations, to fear that the success of

LAFTA will mean the economic domination of the continent by Argentina, Brazil, and Mexico. Finally, LAFTA (along with the Alliance for Progress) has not been able to promote the acceleration of economic growth of the continent. The annual growth rate of the aggregate product for Latin America during the 1960s was slightly more than 5 percent, little changed from the 1950s.

Dilemmas Confronting LAFTA

The failure of LAFTA to achieve accelerated economic development for its members may be attributed to the members' lack of success in resolving several fundamental dilemmas. One such is the decision of whether the region will be a competitive free trade area or a non-competitive region characterized by a rational division of labor. This choice confronts LAFTA with unpleasant alternatives. On the one hand, Latin Americans generally tend to resist incursions of competition into monopolistic markets, and to have little faith in its beneficial effects. On the other, although they may want a non-competitive regional economic system, they are not willing to surrender some degree of sovereignty, a pre-requisite step toward the regional planning necessary for a rational division of labor. Thus, a paradox: what LAFTA institutions have the capacity to do (set up a competitive free trade area), the Latin Americans do not really want; what the Latins do want (a rational, non-competitive economic system), their institutions cannot achieve.

Due to the import substitution policies followed in most of these countries since World War II, the Latin American entrepreneur has usually developed his industrial enterprises behind the protective wall of exclusive national licenses and high tariffs. Because of the extent of such protection, he is not much of a risk taker; he essentially responds to a known market, earning quick profits by catering to the consumption needs of the middle classes in the urban area. Protected from internal and external competition by national controls, Latin American capitalism is too often characterized by poor management techniques, poor quality control, and high production costs. Intra-LAFTA competition might force improvements in this situation, but it is vigorously opposed: the complex item-by-item annual negotiating procedures of the National Schedules allow vested interests to block particular tariff concessions. This is not possible, for example, in the across-the-board approach employed by the EEC.

Even when concessions are negotiated, as 11,000 of them have been, the results are disappointing. A State Department study indicates that two thirds of the tariff concessions negotiated under LAFTA have not been utilized. The nature of the Latin American economy makes this situation understandable. The idea of a free trade association assumes that when member country A reduces its tariff on a

particular product, an entrepreneur in member country B will invest money to begin or increase production of this product to sell in A. However, in Latin America we find that when A reduces its tariff, there may be one of several outcomes: 1) the entrepreneur in B never hears of the tariff reduction; 2) he hears of it, but is afraid of the risk (A may change its mind or have its mind changed by a coup); 3) the entrepreneur cannot acquire the capital or the necessary import licenses to manufacture the product; and 4) the entrepreneur may be frightened off by high transportation costs which hinder intra-LAFTA trade. "The crux of the problem," according to the director of an inter-American investment firm, "is that private enterprise prefers the 'known' results of isolation and protectionism over the 'unknown' opportunities and challenges which economic integration may offer."

If free trade and competition are unattainable, one obvious alternative is regional planning that would bring about a rational division of productive labor within the continent. There is increasing awareness in Latin America of this alternative. The poorer countries now recognize that there is a need for regional planning to serve as a countervailing power to the pull of benefits toward the already strong nations which free trade implies. However, regional planning, to be most effective, should be initiated when there is a firm base of national economic development planning, and such a base has been weak in Latin America. A report of the Pan American Union concluded that in Latin America "most economic and social development plans are made upon an unrealistic basis.... Usually lacking is an evaluation of the operative capacity of the administrative machine to accomplish that part of the overall development plan that is the responsibility of the public sector." The achievement of such facets of positive integration as coordinating national development plans, setting up a common external tariff for the region, and establishing a regional policy toward private foreign investment is more essential in Latin America than in Europe; but given the lower capabilities of the member-states for planning and adhering to plans, it is far more difficult.

In any case, the idea of regional planning confronts the exceedingly delicate issue of nationalism. With each nation pursuing its own developmental objectives, no significant progress was attained in industrial integration, harmonization of trade policies toward the developed world, or monetary or transport cooperation. The success of developmental regionalism requires some supra-national authority which can take a long-term view of the developmental needs of Latin America. Most Latin American political leaders, however, are playing the politics of personal survival in a very unstable arena, which requires an extreme sensitivity to short-run costs and benefits. They believe they cannot afford to sacrifice

immediate national interests—e.g., symbols of modernization such as a steel mill or an automobile factory of their own—for long-term regional interests. Latin American politicians want to retain their control of the allocation of national resources, the skillful manipulation of which helps them stay in office. Public administration studies indicate that many Latin American leaders are extremely reluctant to delegate authority to subordinates; it is not surprising that they are unwilling to delegate power to any international institution analogous to the EEC Commission.

One may view the creation of the Andean Subregional Group as another indicator of the failure of LAFTA to achieve inter-American cooperation. Representatives of Chile, Colombia, Ecuador, Peru, and Venezuela decided to initiate negotiations to form the Andean Group in August 1966; they were dissatisfied with the progress of LAFTA, and were concerned about the domination of the organization by Argentina, Brazil, and Mexico. By forming their own subunit, they would increase the pace of integration among themselves, but remain within the LAFTA framework. After 33 months of negotiations, an agreement was finally signed by five Andean nations, including Bolivia. Venezuela did not become a member because of opposition from its private sector. [NOTE: An associate membership for Venezuela was later developed.]

Some Policy Proposals

The trend of the past few years toward decrease in foreign aid totals, and the dangers of growing protectionism in some of the developed country markets, are likely to make Latin America increasingly dependent on its own resources. Consequently, despite impediments to progress through LAFTA, developmental regionalism is still the most viable strategy available to promote the economic development of the continent. Latin Americans should avoid becoming overly discouraged when a policy encounters difficulty, and instead should try to devise new policies to overcome the obstacles which have blocked progress in the past. To succeed, a number of domestic reforms are needed, but since such internal reforms are beyond the scope of this essay let me suggest a few proposals at the inter-American level which may be helpful in promoting economic integration.

First, it is now painfully clear that LAFTA needs a new tariff-cutting mechanism to replace the present item-by-item procedure. LAFTA members have reached the general conclusion that they should institute an automatic tariff-reduction process which would proceed at differential rates for the products of each of the three groups of countries designated by LAFTA. Tariffs should be reduced the slowest in the less-developed countries (Group A nations:

Bolivia, Ecuador and Paraguay); they should be reduced faster in more developed nations having insufficient national markets (Group B nations: Chile, Colombia, Peru, Uruguay and Venezuela); and they should be reduced the fastest in the most developed countries (Group C nations: Argentina, Brazil, and Mexico).

Second, increased efforts should be made in achieving complementarity agreements, border cooperation projects (such as the construction of dams, hydroelectric plants, bridges and roads), and multi-national programs in such fields as economics, technology, agriculture, and education. There are no automatic formulas that can be suggested here; success in these areas is a function of the political will and the ability to compromise.

Third, there is a need to insure that the benefits which result from developmental regionalism will be distributed equitably. Until the problem of equity is resolved, most nations will be reluctant to extend the full commitment necessary for the success of economic integration. Most Latin American nations will not rely upon the mechanism of free trade to distribute benefits; ECLA has pointed out how unfairly free trade treats the less-developed nations. Neither will Latin American nations accept at this point a supra-national decision-making body to allocate distributive justice. However, LAFTA members may be willing to accept a solution that lies somewhere between these two poles. Such a solution would become possible by broadening the scope of what is called reciprocity.

The reciprocity formula is vaguely spelled out in Articles 10 and 13 of the Montevideo treaty; it constitutes the standard for all LAFTA negotiations. In essence, the formula calls for the reciprocity of trade concessions, taking into account the special situation of the three different groups of countries, which will lead to reciprocity of benefits, as measured by trade figures and new industries. To become a more effective standard for intra-LAFTA bargaining, the reciprocity formula should be expanded to include not only reciprocity of benefits, but also reciprocity of opportunities and sacrifices. This broadening of the formula would allow nations at different levels of economic development a wider latitude of exchanges or benefits, opportunities, and sacrifices leading to equitable compromises. The basic idea I am advocating is that the least developed nations should receive the most benefits and endure the least sacrifices, while the most developed countries should be granted the most opportunities and endure the most sacrifices. Nations with insufficient markets should receive a moderate amount of benefits, opportunities, and sacrifices. All countries must receive more advantages from being a member of LAFTA than from pursuing purely national policies.

Given the limited resources of LAFTA, the success of this policy is heavily dependent upon the systematic coordination of external aid from the United States and such international institutions as the Inter-American Development Bank. External aid should be coordinated to provide incentives for the economic integration of Latin America. Such aid must be employed so that it furnishes the most tangible benefits to Group A nations and somewhat less for Group B nations. External aid for Group C nations should be channeled to the least developed parts of these nations, such as the northeastern part of Brazil. Hopefully, this would provide sufficient incentives to keep Group C nations in LAFTA while helping to combat economic dualism.

Group A countries would receive the most tangible benefits because they lack the capabilities to take advantage of many opportunities. These countries should receive considerably more foreign aid (in per capita terms) than either Group B or C. Attempts should be made to insure that Group A nations enjoy the benefits of border projects principally financed from overseas or by a more developed Latin American country. Technical aid provided by ECLA and political support from other LAFTA nations should be combined to insure that each Group A country is made an integral part of several potentially profitable complementarity agreements. The less-developed nations would be allowed to maintain higher tariffs longer than the other nations, but the tariff schedules should be continually declining.

Group B nations (other than Uruguay) will receive most of their benefits from the Andean Development Corporation (CAF). The CAF is unique among international credit institutions in that it participates directly in studies of projects, puts them into practice, finances them as lender or owner, and finally returns its shares to the collectivity, recouping resources which can be reinvested in other projects. The United States and international institutions should generously aid the CAF to make sure that there are sufficient benefits for all members. Group B countries should be granted ample opportunities to spur their own domestic industrialization through such devices as complementarity agreements and tariff concessions. Group B nations would also be expected to lower their tariffs faster than Group A nations, but slower than Group C. Group C nations, one hopes, have developed the necessary capabilities to take advantage of opportunities represented by tariff concessions and complementarity agreements.

In brief, by expanding the scope of the reciprocity formula, it may be possible to induce the members of LAFTA to commit themselves more completely to the strategy of developmental regionalism. The successful implementation of the expanded reciprocity formula could insure each member that the economic advantages of LAFTA would outweigh the disadvantages even in the short run. In

this sense, reciprocity could serve the purpose of what the sociologists term a starting mechanism of increased international cooperation. Once there is confidence in the fact that sacrifices to the community interest will be promptly rewarded, then it may be possible to tackle the more difficult problems of supra-nationalism, a common external tariff, and a common policy toward foreign investment.

[Excerpted from "Dilemmas of the Latin American Free Trade Association," Journal of Economic Issues. East Lansing (Mich.): published by the School of Business Administration, Michigan State University, for The Association for Evolutionary Economics, Vol. V, No. 4, December 1971, pp. 92-106.]

Common Market in Central Africa

Lynn Krieger Mytelka

[The Central African Economic and Customs Union has made some progress in stimulating intra-regional trade and coordination of industrial plans, but has encountered setbacks and problems in achieving cooperation among poor countries anxious to guard their limited resources for national goals. Some novel cooperative devices were developed.]

In the immediate pre-independence period, leaders from the Central Africa Republic (CAR), Chad, Congo (Brazzaville) and Gabon agreed to continue jointly many of the economic services they were about to inherit from the Federation of French Equatorial Africa; they formed a customs union. Three years later, in June 1961, a partial free-trade area came into existence between this Equatorial Customs Union (UDE) and Cameroun. (All five countries were also members of the Franc Zone.) In December 1964, the Presidents of these five states signed a treaty creating the Central African Economic and Customs Union (UDEAC). However, it appeared that membership involved too much sacrifice for the inland states. In 1968 the CAR and Chad left UDEAC to form a new union with Zaire. CAR rejoined UDEAC after lengthy negotiations, but Chad's withdrawal has not been rescinded.

Integration in Equatorial Africa was conceived from the outset as an agent for economic development, and in particular for industrialization. Large-scale industry obviously required joint efforts. Even consumer goods, it was argued, could not be produced profitably without assured outlets beyond the narrow

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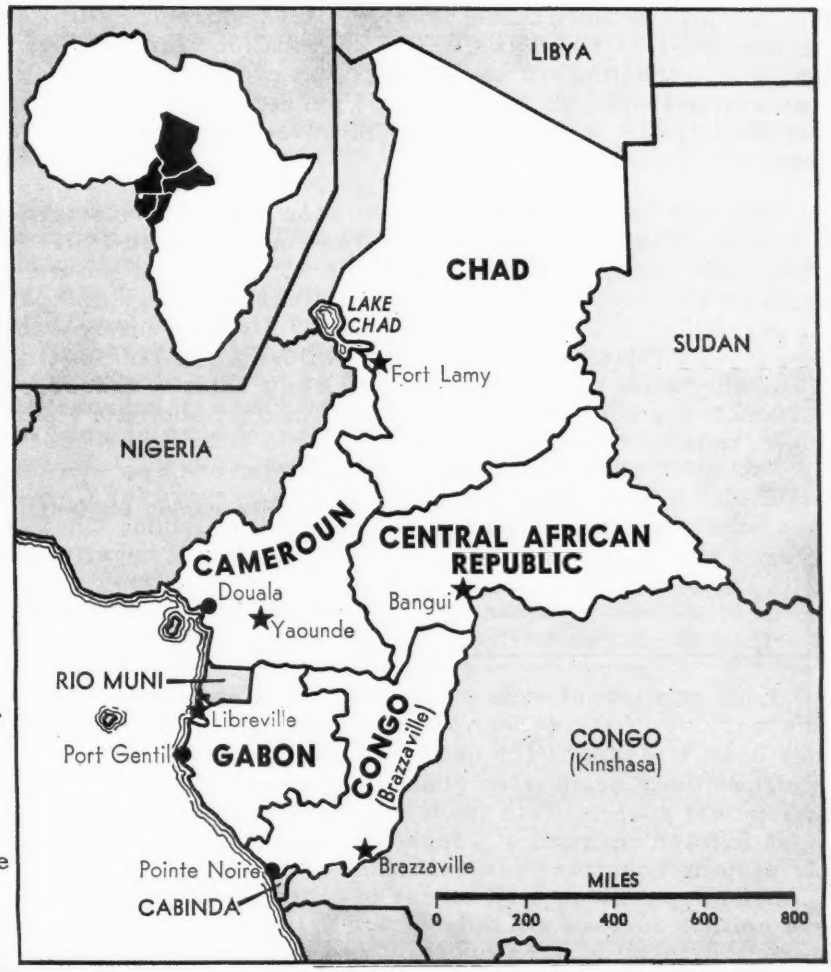
markets of individual states, and this depended on a more far-reaching form of association than a mere customs union. In absolute terms, the UDEAC countries were very poor: when compared with other developing countries, they do not often come out ahead. In 1963, for example, gross domestic product (GDP) in the future UDEAC area was only 331 billion francs CFA (less than $1.4 billion) for a population of 11 million. Interstate trade was hampered by the fact that road links between the UDEAC countries were (and still are) limited, and the railroad which links Chad and the CAR with the Congolese port of Pointe Noire is inefficient and costly.



In 1966 all tariffs and quotas among the five member states had been abolished and a common external tariff had gone into effect. The suppression of tariff barriers between the former UDE states and Cameroun spurred the development of trade between these formerly unassociated states, while the passage of time, beginnings of diversification, and small increases in overall exports served to increase trade among the former UDE states as well. A year before

the signing of the UDEAC treaty, total recorded interstate trade among the five countries was 5,213 million francs CFA, 6.6 percent of their total imports and 6.3 percent of total exports. By 1967 total interstate trade had increased 24 percent to 6,848 million francs CFA and represented 6.8 percent of the region's imports and 8 percent of its exports.

Over 80 percent of all goods traded were manufactures, and the value of trade in manufactures alone increased in 1967 by 14 percent over the 1966 figure. In that year, 53 percent of the manufactured goods were exported by the Congo (Brazzaville), 29.6 percent by Cameroun, 13.2 percent by the CAR, 3.4 percent by Gabon and 0.4 percent by Chad. The reverse relationship is true of importers. Chad imported 38.8 percent of all manufactures traded within UDEAC, the CAR imported 22.5 percent, Gabon 20.9 percent, and Cameroun and Congo (Brazzaville) 11.5 and 6.3 percent respectively. Clearly an imbalance in trading relationships was developing in UDEAC, an imbalance which was more serious for Chad than for the two other "consumer" states since, unlike Gabon, Chad had no surplus in its external trade to counterbalance its negative trade balance with its UDEAC partners.

Further Obstacles to Cooperation

Lack of resources has had even more serious consequences for the working of the economic union than the trade imbalance. There has been a tendency for national leaders to guard what meager resources their economies generate for use in fulfilling national development goals. This tendency is exaggerated by their dependence upon foreign sources of supply for development. Many leaders in developing countries are reluctant to see foreign aid diverted to regional projects—or still worse to other countries in the region. As yet neither foreign aid donors nor private foreign investors have been convinced of the importance of deferring to a regional approach in economic planning.

This problem is complicated by the difference in levels of development among the member countries. Cameroun is the largest unit within UDEAC on several counts. Roughly 5 million, i.e., 45 percent of the people in UDEAC, are Camerounians, and the Cameroun-ian economy generates 46 percent of the total GDP in the region. The gross domestic product of Gabon, a country of barely half a million people, is more than 3.5 times higher on a per capita basis than the Cameroun GDP. However, this does not indicate that the Gabonese peasant is more deeply involved in the monetary economy than his counterparts in other UDEAC countries, nor that local industry has developed; it reflects the extent to which foreign-owned, export-oriented mineral and forestry interests have taken root in that coun-

try. The Congolese economy, with an intermediate level of per capita GDP, is both more internally integrated and more integrated in the union than the Gabonese. Twenty-six percent of the total exports of Congo (Brazzaville), for example, go to its partners, and most of these exports are manufactures. In contrast, only 6 percent of Gabon's total exports are exported to UDEAC.

Of particular importance for the integration effort is the dichotomy in economic development between Cameroun, Congo (Brazzaville) and Gabon on the one hand, and the CAR and Chad on the other (see accompanying table). The distribution of industrial establishments in the UDEAC countries reveals most clearly the industrial lead taken by Cameroun and the Congo. It also demonstrates the tendency for industry to cluster in the coastal states. More than 75 percent of all industry in UDEAC is located in Cameroun, Congo and Gabon, which provide fully 84 percent of the total labor force in industry within UDEAC and 83.9 percent of the region's exports.

Economic Differentials among UDEAC Members

	GDP—1965 (billions Fr. CFA)	Per capita GDP—1965 (Fr. CFA)	Exports 1970 (millions Fr. CFA)	Distribution of industries (%) 1966
Cameroun	167.1	32,000	30,168	43.3
Gabon	54.5	116,000	29,680	12.5
Congo	39.3	44,000	11,730	22.0
Central African Republic	41.8	32,000	7,166	13.7
Chad	59.0	18,000	6,635	8.5

Compensatory Mechanisms

Fearful of remaining perpetual dumping grounds for the industrial products of their coastal partners, Chadian and Centrafrican leaders urged their partners to find ways of reducing the distribution crisis within the common market. The treaty contains three measures designed to provide integration's benefits and compensation to the lesser developed member states. The first is the single-tax system. The single tax, levied at the factory on all manufactured goods destined to be traded within UDEAC, replaces all interstate customs duties and domestic taxes on these products; and no manufactured article may be traded until a single-tax rate has been assigned to it. The proceeds of this tax are redistributed to each of the states on

the basis of their consumption of the product. The rate of the single tax is invariably lower than the duties and taxes to which the product would have been subjected in the absence of a customs union. In conjunction with a high external tariff, the single tax thus secures a greater advantage for local industry over imports, thereby encouraging both import substitution and specialization.

It is also a compensatory mechanism. First, it enables consumer states to recuperate part of the revenue lost through trade diversion. Second, it can be and on occasion has been used to improve the competitive position of products manufactured in the less developed countries of UDEAC by granting a lower tax rate to the product of an inland firm than to a similar product from a coastal firm.

"Industrial harmonization" is another method aimed at distributing the benefits of industry fairly by rationalizing economic competition, insuring that duplication of industrial capacity does not reduce the overall benefits gained from integration, and increasing interstate trade through specialization. But the provision of an industrial plan which will insure this has been one of the most controversial tasks undertaken by the UDEAC Secretariat. No single plan has as yet won the approval of all member states, and leaders from the inland states in particular feel that plans under consideration will merely perpetuate the present industrial imbalance.

Other attempts at industrial coordination have similarly difficult histories, with one important exception, the creation of a UDEAC oil refinery at Port Gentil, in Gabon, and the tacit agreement to consider Douala (Cameroun) as the site for a second regional refinery when conditions warrant it. An attempt to create a single glass works for the region failed to reconcile conflicting interests, and three glass works are presently under construction or have begun production. The limitation of textile production to the cotton producers of the region—Chad, the CAR and Congo (Brazzaville)—was also short-lived, although a new agreement has now been concluded.

The third compensatory mechanism in UDEAC is the Solidarity Fund. This was partly conceived as a way to reimburse the inland states for errors in recording imports at coastal ports when these imports were subsequently shipped inland, but its other functions were considered of even more importance by the Chadian and Centrafrican leaders. More than any other single mechanism, the Solidarity Fund is a means of compensating the less developed member states both for their inferior economic status within UDEAC and for the benefits others received from the union. Lump-sum contributions are made to the fund annually by each of the member states. The basis for contributions was never clearly defined, and the amount of both the total fund and individual contributions has had to be decided

anew each year. Attempts to rationalize contributions according to the benefits obtained by each of the member states have failed primarily because differing interpretations of the fund's purpose have led to widely differing measures of "benefit." Proceeds from the fund were distributed to Chad, which receives 65 percent, and the CAR, which receives 35 percent. But although the total fund stood at 1.85 billion francs CFA in 1968, leaders from the two inland states felt that their share was inadequate. Since the CAR rejoined UDEAC, possible alternatives to the fund have been discussed. One possibility is the creation of a fund to guarantee investments which might later develop into a UDEAC development bank.

UDEAC Structure

Three administrative bodies were set up by the UDEAC treaty. They are the Council of Heads of State, the Ministerial Management Committee, and the Secretariat General. The Council of Heads of State, which meets once or twice a year under a rotating president, is the supreme decision-making body of the union. The management committee acts "by delegation of the council," and its decisions must be unanimous. Although the council lays down broad directing lines, it is the management committee which calculates and assigns single-tax rates on individual products, designates positions and rates on the common external tariff, and discusses—line by line—draft investment codes and industrialization plans.

Although the Ministers who comprise the management committee like to refer to themselves as technocrats, few of them in fact are; technocratic role playing is not always feasible nor often practiced. However, the difficulty of achieving compromises within the management committee is not solely a result of its political composition. Technical studies point up the limited alternatives available to the UDEAC states given their unequally distributed resources, lack of domestic capital for development, and inability to control the application of what funds are available to jointly conceived purposes. Since few economic issues are of minor significance in the drive to develop, technical matters rapidly become politicized. The result is an increasing number of contentious issues which must be arbitrated by the Council of Heads of State.

When such controversy causes delays in decision-making, those states which are in a position to seek help on an individual basis have on occasion done so. The inland states, which are unable to attract new industry on their own, naturally regard this as detrimental to their hopes of ever catching up. To forestall further conflict, however, certain of these acts have been sanctioned retrospectively by the UDEAC Council. One recent instance was the approval of the decision by Congo (Brazzaville) to create its own

textile industry despite numerous pleas for a halt to the proliferation of spinning, weaving, printing and dyeing plants within the common market. Under the new textile agreements of April 1969, the product of the Congolese plant will ultimately be given a single-tax rate so that it may be sold in other UDEAC countries.

The weakest link in the organization of UDEAC is its Secretariat General. In addition to its administrative and information-diffusion tasks, the secretariat was given new research functions, a watchdog role, and the opportunity for some initiative in the harmonization of development plans and transportation policies and in industrial cooperation. UDEAC members are obliged to supply the secretariat with detailed reports on their national development plans so that it can harmonize them. According to the treaty, the secretariat "must point out the distortions which may have been noticed with regard, in particular, to the goals of harmonization...and certain proposals aiming at correcting such distortions." By explicitly requesting the secretariat to point up problem areas and propose solutions, the treaty provides ample latitude for innovation. Three years later, however, decision-makers preferred a more conservative estimate of the secretariat's potential. It was described as an administrative institution with some research functions, and its autonomy extended only to the preparation of dossiers for the management committee and council. Its failure to play a more assertive role in UDEAC is partly due to its limited manpower and money.

Largely as a consequence of Chad's withdrawal and the necessity for it to establish bilateral relations with the remaining UDEAC members, relations within UDEAC have also been tending to follow a bilateral pattern as well. UDEAC is clearly in a period of readjustment, but the decision to continue the union despite Chad's withdrawal is a healthy sign. With the possible exception of Cameroun, none of the UDEAC states can expect to achieve their economic goals in isolation; and each has much of importance to contribute to the others.

[Excerpted from "Common Market with Some Uncommon Problems: UDEAC Chooses Cooperation Despite Unequally Shared Poverty and Some Severe Clashes of Interest," Africa Report. New York: African-American Institute, Inc., Vol. 15, No. 7, October 1970, pp. 14-17.]

Book Review

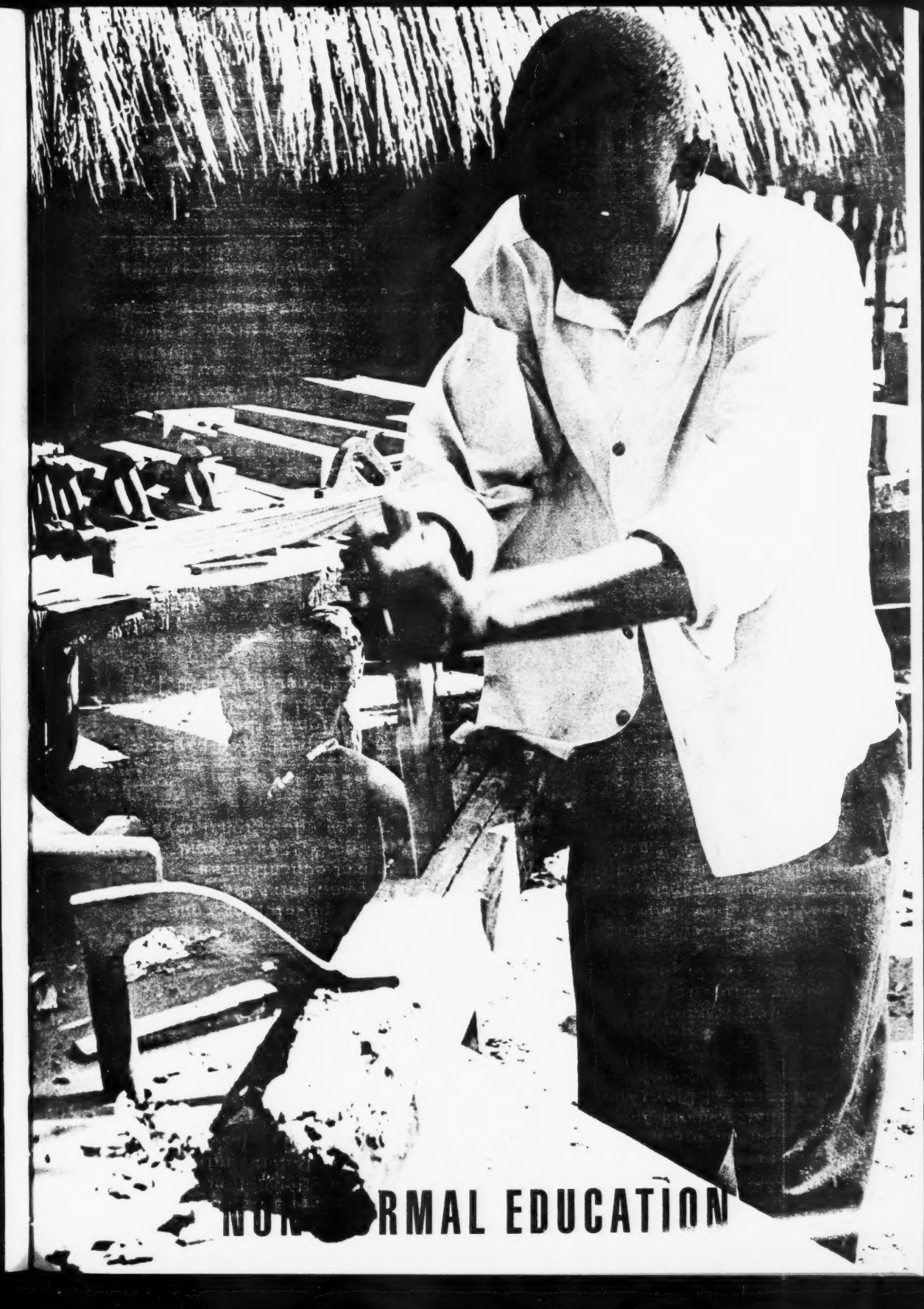
Mutharika, B. W. T., Toward Economic Cooperation in Africa. New York: Praeger Publishers, 1972; 458 pp.

B. W. T. Mutharika, Economic Affairs Officer for the United Nations Commission for Africa, has authored this lengthy compendium of information on that continent's efforts toward economic cooperation, including much data on the African economies. For students of African affairs or regional integration generally, this book will be especially useful for its detailed history of the organization and functions of both sector-wide and multi-sectoral associations of these nations. Supplementing these descriptions are maps showing the geographic spread of the regional groupings, charts describing institutional machinery, and tables depicting trade within each sub-group. Descriptions of inter-African road and rail systems and communications networks are helpful. Two other aids worth singling out are lists: one defines, inter alia, 14 acronyms referring to African economic associations, and the other provides basic facts on all multi-national and intergovernmental organizations in Africa as of September 1971.

While the book is clearly useful as a basic reference work for African economic cooperation, the author also had a broader objective in mind. That objective was to evoke a greater commitment to economic integration in Africa by reviewing past efforts and by assessing African economies to show how various problems might be resolved through joint effort. In this broad purpose the book is less successful. The author does not and perhaps cannot be expected in one volume to deal with many of the issues which are at the center of discussions on development. Economic objectives tend to be presented in

generalized terms, with virtually no analysis of problems. Conflicts of interest and development orientation are dealt with by exhortations toward multi-national cooperation. The difficulties that the author perceives are essentially organizational. Thus he contends that: "The main problem of cooperation...has been, and will continue to be, the creation of ideal multi-national institutional machinery capable of meeting requirements for economic development at both the national and multi-national level." A dissenting view might be that what African regional organizations may need more than adequate secretariats and delegations of supra-national authority is a sense of shared purpose and mutual self-interest in the success of the organization.

In his recommendations for the future, the author suggests that specific concrete interests generate greater success in cooperative efforts than the more elaborate multi-purpose objectives. He notes that joint efforts on individual projects appear to be the most effective approach to economic integration in Africa at this time. While he argues that such individual multi-national projects must be envisaged within a broader framework of multi-sectoral strategy, he acknowledges the utility of "the project approach" and urges that international organizations pay more attention to and assist such efforts. As if in response to this suggestion, in December 1972 the World Bank concluded a $26.5 million loan agreement with the East Africa Harbours Corporation of the East African Community (EAC) for port improvement. Thus, despite recent conflict among members of the EAC, the work of a vital common service corporation will continue.


NON-FORMAL EDUCATION

SENEGALESE AT HIS WORKBENCH
WHERE HE MAKES WHEELBARROWS AND PLANES,
USING SKILLS ACQUIRED FROM A TRAINING CENTER
FOR RURAL ARTISANS IN KAFFRINE.
[PHOTO: INTERNATIONAL LABOUR OFFICE]

Non-Formal Education

Office of Education and Human
Resources, U. S. Agency for
International Development (AID)

[The sharply rising costs and the limitations of scope and developmental effectiveness of formal education in developing countries indicate the need for non-formal methods of imparting skills, knowledge and attitudes to large numbers of people at lower cost. But there is rather little organized information available on the many, scattered activities of this kind; experiences should be studied and compared, and new conceptions developed for ways of organizing non-formal educational systems.]

Throughout history, the vast majority of people have acquired social, economic and political skills through non-formal learning experiences. Traditionally this process of inculcating knowledge and skills was based in the family, the tribe or the village, and was an integral part of the whole culture. Although it was central to the system of "governance," it was only in the most marginal way a responsibility of "the government." European colonial rule introduced two fundamentally new educational concepts: 1) that education, for purposes of colonial administration, was a necessary responsibility of the governing power, and 2) that such education was the accepted mode of vertical social and economic mobility. These two concepts have left an indelible mark on the now independent and developing countries. The high value traditionally placed on non-formal education and learning has atrophied. Formal education on essentially European lines has acquired a pervasive value system often far out of proportion to its relevance and usefulness to society.

During the past 15 years the less developed countries (LDCs) and external assistance agencies have tended to concentrate their educational efforts on the

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development of formal school systems and universities. Given the historical backgrounds of the LDCs, such concentration was perhaps inevitable. By-products of this drive, however, have been continuing neglect of traditional modes of non-formal education and failure to perceive the vast gap which could not possibly be filled by the formal educational system.

Growth in populations and changes in the economies and aspirations of the LDCs render impossible a resort to ancient forms of traditional non-formal education. On the other hand, the traditional method of formal education is becoming prohibitively expensive for most LDCs, given their increasing numbers of students and lack of financial resources. In most countries educational costs are increasing at a rate faster than national income and gross national product. A very large proportion of the present and future population of most newly developing countries will receive little or no formal education at all. For many LDCs, the only opportunity for skill and knowledge development for the populace as a whole is through some kind of non-formal education.

The only possible escape from this educational dilemma appears to be a far more perceptive and purposeful effort to make education and learning an integral part of life where people live and work. It now appears clear that the skills, knowledge and capacities of the labor force (and indeed the whole population) are developed as much through experience, on-the-job training, recreational and cultural activities as they are through formal schooling. It seems equally clear that this non-formal mode of learning could be very substantially increased in value and extended in scope by more imaginative planning, organization and leadership.

We have rather little organized information on non-formal educational activities in the LDCs, a field that has not been given much attention by educators. We do know that various LDC groups are conducting a considerable array of non-formal educational activities and projects, and a few have launched apparently successful programs of one sort or another. Within developed countries, non-formal education makes an extremely important contribution to all manner of human resources development, of both a general and a highly specialized nature. One of the important characteristics of such activities is that they often begin in order to meet real needs and end when the need no longer exists. In this sense, non-formal education efforts are frequently more responsive to real needs and new concepts, as determined in society and in the marketplace, than are formal and traditional educational endeavors. Emphasizing non-formal education does not necessarily mean de-emphasizing formal education. It does mean developing a new dimension of education which can provide learning experiences for a much larger proportion of the population in the places and environments in which they live.

Major Obstacles to Non-Formal Education

Lack of clear definition and concept. Considering the crucial role which non-formal education has played in the developed countries, and its growing importance in the LDCs, it has proved extremely difficult to evolve a definition of the term which is understood by and acceptable to professional educators. This is caused largely by 1) our present inadequate knowledge of educational activities carried on outside the formal school system, 2) a tendency of educators to think of education only in terms of formal, graded systems, and 3) the wide-ranging and amorphous nature of non-formal educational activities, frequently private in origin and management and often achieved as an important by-product of a venture primarily directed at objectives other than education (e.g., rural cooperatives).

Equally difficult has been establishment of the concept of non-formal education as a system of education, quite different from formal education systems, but potentially capable of providing non-school populations with educational services systematically and in ways which significantly serve individuals, societies and the purposes of national development. It is unlikely that non-formal education can become recognized, respected and propagated as an important national enterprise in education until a suitable definition and concept of it can be evolved and acquire wide international understanding and acceptance. This will require serious and sustained investigation, analysis, experimentation and evaluation by foreign assistance agencies and by the LDCs.

Physical and social isolation of population groups. The population generally most in need of non-formal educational opportunities are the farm and village people and the urban poor. These are the groups least likely to have access to more than minimal formal education, contain the highest proportion of adult illiterates, and make up the great bulk of national populations. Physical, economic and social isolation combine in various ways to preclude their ready access to non-formal learning experiences which could enhance their capacities as individuals or as participants in society. A substantial increase in investment in rural development, including both infrastructure and services, is obviously required. These are the most direct ways of producing a "learning environment." However, modern communications technology gives promise of becoming a major tool for reducing the distances and bringing educational (and recreational) experiences to these isolated populations, at costs which can be borne by the LDC economies.

Organization and resources. Despite the rising costs of formal school systems and the fact that this increasing financial stress has

stimulated interest in non-school education, few countries have clearly seen a major role for strengthening non-formal education. The result is that few countries have any organization (delivery system), financial resources, or personnel dedicated to an overall interest in non-formal education. Ministries of education, generally speaking, see it as of no consequence, as a potential competitor for resources, or as an illegitimate form of education which ought to be locked into the formal system. Consequently, many who understand the potential role of non-formal education feel that its promise would be wholly lost if it should come under the dominance of the ministry of education. While this is no doubt a hazard in some countries, it is perhaps no less hazardous to attempt to create separate education delivery systems in countries which are rapidly becoming unable to afford even the one they have. Among the obstacles to be overcome, then, are those that hamper development of compatible systems of formal and non-formal education, and a healthy exchange of experience between them.

Non-formal education, by its very nature, should be more diverse in organization, funding and management than the formal system. It should emphasize local initiative, self-help and innovation on the part of large numbers of private and public institutions. Nevertheless, a sensible, national program requires a degree of national planning, coordination and funding. The use of modern communications technology can hardly escape some form of national operation.

The knowledge gap. Assuming reasonable progress on the foregoing obstacles, we are still confronted with a serious lack of basic knowledge regarding the subject matter, effective means of delivery, and specific effects of many kinds of non-formal education. There have been few cost-benefit studies of this type of education; its effects on behavior, particularly in non-economic fields, are known only by random, anecdotal cases. We can only surmise what the sources and magnitudes of funds would be for education explicitly related to economic and social interests of people, employers and governments.

The few authentic success stories almost inevitably point to one man or woman, a unique personality without whom the success story could not have happened. The unique personality is obviously a major asset in any field, but is no substitute for information, analysis and insight in defining problems and in creating institutions capable of dealing with them, since these will have to be manned largely by non-unique people if they are to make any major contributions.

Interrelationships with other development sectors. One of the distinctive features of non-formal education is that it aims far more explicitly at changes in behavior than does formal education. Al-

though there are important exceptions (cultural and recreational, for example), the main point of non-formal education is to induce changes in attitude and behavior: improved agriculture, better repair of an automotive engine, greater productivity in factory production, fewer and healthier babies, better nutrition, more effective participation in solving village problems. Yet the principal custodians of these various sectors, in the LDCs and in the assistance agencies, are different people, with different professional skills and usually in different organizational units. These suggest some of the obstacles in bringing to bear non-formal education as a tool of multi-sectoral development.

Toward a National System of Non-Formal Education

Over the past 20 years, an enormous quantity of literature has been produced on a wide variety of activities which we could now call "non-formal education." This literature deals with experiences in agricultural extension, handicraft programs, cooperatives, participation of women in development, literacy training, labor education, political orientation and behavior, family planning and so on. Certain large and sustained sectoral and regional programs—like the Comilla Project in Bangladesh or the Indian community development experience—have been studied and reported at great length. Much of this "research" has considerable validity and its values must be exploited more fully as non-formal education assumes a clearly identified and high priority by the LDCs and the assistance agencies. Thus far, however, there has been very little authentic research on non-formal education as a purposeful national system of education designed to make significant learning experiences available to a very large proportion of the non-school populations of the LDCs.

Undoubtedly there is much to be learned from a host of experimental projects now being tried out, of which some have progressed beyond the experimental stage and are regarded as tested, on-going activities. One of the best examples of the latter is the Mobile Trades Training Unit Program in Thailand. This program, started in 1960 with one unit, has a nationwide network of some 30 units and provides trades training for periods of five months for over 20,000 participants annually. In Latin America, industrial apprenticeship training is organized by the Servicio Nacional de Aprendizaje (SENA), which is considered to be beyond the experimental phase and has been used as a model by several African and Asian countries. Various kinds of reports are available on other full-scale programs, like the Village Polytechnic Program in Kenya and the many cooperative efforts in Latin America, some operated by governments and some by private institutions, principally the Catholic Church. Israel has reportedly had exceptionally success-

ful experience with non-formal educational programs. In addition, there are innumerable examples of experimental or semi-established projects, such as youth corps, quasi-military organizations, the "Year of Service" program at Hailie Selassie I University in Ethiopia, education TV and radio programs aimed at various population groups, etc. But very few of these have been carefully studied and documented, and in almost no instance have they been conceived as elements in an overall design for the education of non-school populations. The learning and behavioral-change experience in these various settings have never been compared and evaluated with this purpose in mind.

Thus far these non-formal educational activities have been regarded and conducted as adjuncts to other sectors of development, not as elements of a national educational enterprise, formal or non-formal. In many cases, they have sought "legitimacy" through nomenclature (The Rural Academy in Bangladesh, Village Polytechnics in Kenya), through affiliation with some element of the formal system (vocational schools and comprehensive high schools) or through adoption of many of the trappings of formal education (certificates, diplomas, entry requirements and time sequences). What is fundamentally wrong about such attempts at legitimacy is that they imply to leaders and participants alike that non-formal education is a bastardized, inferior kind of formal education—that non-formal learning, however valid, is less respectable than formal education, however irrelevant the latter may be in functional terms.

The developed countries have propagated this illusion by their own behavior and by their advice and assistance to the developing countries. Consequently, they have a responsibility to assist the developing countries (and themselves) to reinterpret education as "learning for life," not "sitting for an examination." It is around this concept that a doctrine, a value system and an educational mystique must be built.

[Excerpted from an unpublished paper prepared for discussion in the U.S. Agency for International Development, Washington, D.C., December 1970.]

Brigade Training in Botswana

James R. Sheffield and
Victor P. Diejomaoh

[An innovative vocational program for primary-school leavers has been launched in Botswana to provide training in building, farming, textile and leather work while the students—grouped in "brigades"—help pay much of the cost of this activity by simultaneous productive work in their new trades. The brigades have been expanding in numbers and types of training. Their eventual success cannot yet be judged; one limitation on expansion is the slow growth in market demand for some of these skills.]

Brigades are training programs for youth in Africa. The term was first used in connection with Ghana's builders' brigades, founded by Kwame Nkrumah in the late 1950s. The brigades in Botswana, less ideological than those in Ghana, have attracted a great deal of attention because they provide vocational training to school leavers at little or no cost to the government and because they make innovative use of scarce resources. The Brigade Movement, which has its creed and a talented and committed group of disciples, was founded by Patrick Van Rensburg, a South African by birth who fled South Africa in rejection of apartheid in 1962 and took up primary-school teaching in Serowe, Botswana's largest town. In the next year, Van Rensburg and his wife established Swaneng Hill School, the town's first secondary school. From the outset, Swaneng Hill School was oriented towards the poor rural community.

Eschewing the traditional academic pattern often found in Africa, the school was guided by certain new

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principles: 1) Selection would be based on a first-come, first-served basis rather than on academic examinations. 2) Students would contribute voluntary labor rather than pay fees. 3) Staff—at least during the initial years—would be primarily recruited from overseas volunteer organizations. 4) Training would emphasize skills related to rural Botswana. 5) Academic subjects would not be neglected, but the school would include a greater emphasis on the development of Botswana. "Development Studies" was the name given to a required course that focused on actual development problems of Botswana—economic, social, cultural, etc. 6) Recurrent costs would be covered by self-help and by income derived from work done for outside agencies.

The Brigades

A blending of the last two goals led to the creation of the first Builders' Brigade at Serowe in 1965. Brigades were a logical outgrowth of the Swaneng Hill experience; they provide a cheaper means of giving primary-school leavers an opportunity to find employment or to be more productive in self-employment. The brigades have grown dramatically; in 1971, there were 31 brigades with about 850 trainees. Training concentrated on such areas as building, carpentry, farming, handicrafts, mechanics, textiles and tanning. Ten of the brigades are under the jurisdiction of the Swaneng Hill Board of Governors (which now runs a second school at Shashi River) and the rest are divided between local councils and the Department of Community Development, the Botswana Government agency that overseas family welfare and other social programs. Fees in most brigades average $21 per year. Training generally lasts three years and consists of vocational training, academic education (mostly English, mathematics and development studies) and work. In addition to fees, trainees contribute their labor and the value of whatever goods they produce. In most brigades, the educational component takes about 20 percent of the time; by the third year, trainees are generally considered to be productive in the sense that they are paying back part of the cost of their training.

Builders' Brigades. After six years, the Serowe Builders' Brigade has broken even in terms of recurrent expenses. Between 1966 and 1969 the Serowe Brigade completed some $112,000 worth of projects; about one third of this work was done for Swaneng Hill School. The Builders' Brigade at Shashi River has also benefited from its association with the secondary school, but gradually both brigades have moved into general contracting jobs in their communities. The 1969 recurrent expenditures of the Serowe Builders' Brigade show that the budget involved was extremely low.

These expenses averaged out at 92 cents per trainee per day (figuring a five-day week and an 11-month year); the Serowe Brigade

charged $1.04 per trainee per day in its job estimates. This left a modest profit margin of 11 percent. But because trainees spend an average of one day a week in academic education, the actual cost per trainee per day worked out to $1.33, or roughly 30 percent above the amount charged. These expenses do not take the critically important contribution of expatriate staff into account. Although Botswana's heavy reliance upon expatriates will decline as more nationals are trained, the problem of getting highly trained, committed staff to work in remote rural areas will not be easily solved.

Serowe Builders' Brigade

Recurrent Expenses—1969

A. Trainee expenses		
Food		$ 4,254.60
Technical instruction		10,136.80
Student transportation		1,709.40
Building and equipment		179.20
Tools for trainees		561.40
Textbooks		112.00
Academic teaching		701.40
	Subtotal	$17,654.80
B. Business expenses		
Administration		$ 442.40
Workshop charges		354.20
Transport of material		1,120.00
Supplies		136.60
Tools for brigades		404.60
	Subtotal	$ 2,457.80
	Total	$20,112.60

In contrast to the Builders' Brigades at Serowe and Shashi River, the Brigade at Lobatse receives grants from the Community Development Department and does not aim at covering recurrent costs. The Lobatse Builders' Brigade, however, has remained cost-conscious and has become extremely efficient in competing with local contractors. The Lobatse Brigade's close links with the local town council have more than compensated for its lack of ties with a secondary school; thus far about 70 percent of total work completed has been contracted through the town council. The Lobatse Brigade currently charges 99 cents per trainee per day worked, which enables them to underbid local contractors consistently. This price, however, covers only 60 percent of recurrent costs. Remaining costs are met by the Community Development Department and the Peace Corps.

Because of the considerable demand for trained builders in all of the towns in Botswana, builders' brigades have thus far had a favorable cost-benefit ratio. Estimated capital costs are only $70 per trainee for basic tools and equipment. Thus far, trainees have easily found wage employment, but the demand for builders will eventually slacken, highlighting the critical question facing all pre-vocational training programs—can they stimulate increased productivity among the self-employed? In a poor country like Botswana, with a small and scattered population, the growth of self-employment oppor-

tunities will be rather slow and mainly limited to the few urban centers. For the time being, however, enough of the labor force is non-Botswanan and the growth of the economy is sufficient to generate demand for skills.

An experiment to encourage good work habits was made by the director of the Kanye Builders' Brigade. He offered cash incentives to trainees who completed projects ahead of schedule. Preliminary indications are that such incentives help to develop a trainees' sense of responsibility, rather than simply treating him like a student until he must compete with other workers in the job market.

Textile Brigades. There is a great need for expanded training opportunities for young women throughout Africa. A workshop was established at Serowe in 1967 to give girls a two-year course in spinning, weaving, and dressmaking. Shashi River introduced a similar course in 1969 and both establishments have not added printing and dyeing to their program. Capital costs are about $280 per trainee at Serowe and about $140 at Shashi River. In addition, it costs $84 per trainee for accommodation in brigade-built rondavels.

The Serowe Brigade's expenses are estimated at $1,400 per month, assuming an enrollment of 120 girls. Thus far neither textile brigade has been covering its costs, and initial efforts to place trainees in jobs have been discouraging. After some of the girls had difficulty finding jobs, a group of trainees formed a marketing cooperative called "Unity Workshop." Although it is still under the supervision of Swaneng Hill, the workshop managed to pay its five to seven girls (numbers continue to fluctuate) some $25 per month in wages, while registering a small profit. Although the quality of the cooperative's products has remained high and the emerging tourist market in Gaborone and Francistown is being explored, marketing (and thus employment) has been the main difficulty in the textile brigades.

Farmers' Brigades. Botswana, like most other African countries, depends primarily upon agriculture for support of more than 80 percent of its population. Despite the clear need for technical skills in the modern sector, the greatest challenge to those concerned with training lies in agriculture. A farmers' brigade was established at Serowe in 1967 to train 80 students per year (subsequently reduced to 40) for careers in farming based on livestock raising. Some $210,000 was raised from the Danish Government (roughly $1,500 per trainee) to meet the capital costs of starting a beef ranch. This money also underwrote projects in dairy farming, chicken raising and small stock raising (Angora goats to produce Mohair for the textile workshop). Work was also done in irrigation, growing of fodder crops, and dry-land farming.

The Farmers' Brigade at Serowe, however, faced a number of problems. Beef ranching—the most profitable agricultural pursuit of Botswana—requires considerable capital but little labor. Dairy processing requires a sophisticated understanding of pasteurization, hygiene, and packaging, as well as access to a market; Serowe had none of these. A severe drought ruined initial efforts at dry-land farming. Motivation remained a major problem: trainees wanted certificates (to obtain wage employment), despite constant statements that their training was to lead to some form of cooperative settlement. However, local tribal authorities refused to make land available for establishment of the cooperative. In any case, the cooperative settlement would not have generated sufficient income to allow the project to pay for itself.

The Farmers' Brigade at Shashi River has avoided some of these problems. It purchased land from a private owner, and its location near Francistown provides it with a convenient market for produce. Still, the problem of establishing a cooperative settlement for the program remains. (A third farmers' brigade, at Mochudi, was designed to train 20 students in improved farming and animal husbandry who would return to their family farms after their training.) The trend at Serowe and Shashi River is towards what has been called in situ schemes. In such a program, land is set aside for trainees when they are recruited; training is divided between the central brigade farm and the trainees' settlement farm. The farmers' brigades are increasingly locating post-training positions before training starts. This approach necessitates close links with the local community to get them to make greater contributions in terms of land, cattle, or, in some cases, capital.

Other Brigades. Brigades for mechanics, handicrafts, leather tanning, printing and hotel keeping are being developed. Most of their unit costs lie somewhere between the relatively inexpensive builders' brigades and the costly farmers' brigades. Swaneng Hill has developed a mechanical brigade that relies heavily upon Oxfam, a British private international assistance group, and other external donors; it has had difficulty finding enough mechanical work to keep trainees occupied. Swaneng Hill also set up a leather tanning brigade with an extremely well-qualified Botswanan instructor. This occupation has good prospects, due to the extensive livestock in Botswana.

Relations with Government, Schools, Communities

Government plays an important role with regard to external financing. As in most African countries, all requests to donor agencies are channeled through the Ministry of Development Planning to ensure that all development projects can be integrated within an

overall strategy. The Swaneng Hill complex has demonstrated its ability to raise more impressive amounts of outside money than the government has yet raised for other brigades. The relationship of brigades to the Ministry of Education and to Botswana's secondary schools has not been clearly defined. Through its newly established Division of Vocational Training, the Ministry of Education has the opportunity to integrate "education" with "training" (the latter usually being the responsibility of the Ministry of Labor). The rationale for linking brigades and secondary schools is based on three objectives:

1. To help break down the social gap between academic students who aspire to wage employment and the vocational trainees who must usually settle for a lower socio-economic position.

2. To take advantage of the considerable concentrations of talent found on, or near, a secondary school compound. Teachers of academic subjects, and their wives, are often willing to assist in various brigade activities.

3. To provide a ready market for the brigades' products. The Swaneng Hill and Shashi River Brigades at first produced goods primarily for secondary schools.

The success of the Lobatse Brigade indicates that links with the local council may be at least as important as ties with secondary schools, especially after the artificial demand of the schools for brigade products slows down. The need to ensure that farmer brigades produce trainees who will be engaged in productive employment has led to the development of programs in which the adult community participates in planning and makes a contribution (land, cattle, equipment) toward placement of trainees. As proponents of other self-help programs have discovered, however, local community initiative—the key to these approaches—does not always coincide with the aims of assisting institutions, public or private.

Boiteko

The latest project associated with the brigades is Boiteko, a form of communal "swap shop" in which members exchange their labor and the goods they produce for vouchers that can be used in the Boiteko store. This store carries only those goods produced by exchange members. Boiteko represents a recognition of the point that training alone does not create jobs. As Van Rensburg says, "We can train builders, but can ordinary people afford to employ them? We can train tanners and leathermakers to make shoes and bags, but will all these things find buyers?" It is much too soon to assess the success of Boiteko, but in poor rural communities it may constitute an

effective means of mobilizing peasant farmers into cooperatives. It is unlikely that farmers will buy or sell for vouchers if they can sell produce for money and buy superior quality goods. Because of the financial constraints upon establishing training programs, and the danger of saturating local markets with both skills and produce, the Boiteko experiment bears watching as an effort to generate local resources.

The unique characteristic of brigades in Botswana is their attempt to cover recurrent costs; it is this feature that is most significant for other countries interested in the model. As has been demonstrated, cost-covering is feasible, but with two important qualifications: 1) Expatriate staff must be available and willing to work for minimal salaries. 2) Cost-covering can only work where there is sufficient demand for the skills and products of brigades. In a poor country local demand is severely limited. Botswana also suffers under a serious disadvantage in trying to develop new industries by virtue of its membership in the South African customs union, which floods the country with inexpensive South African goods. This, plus the lack of an adequate local market, places severe restrictions on the expansion of the brigade system.

Although it is clearly desirable for brigades to be expanded and integrated into some sort of national youth program, such expansion would now be premature. The small size of isolated brigades, in contrast to the dimensions of the primary-school leaver problem, indicates that brigades alone cannot solve that problem. Because of the importance of local demand, it appears that the brigade model might thrive more readily in areas of Ghana, Nigeria and Central Kenya where rural marketing potential is much greater than in Botswana. This raises an ironic problem; it would be unfortunate if—like so many other aspects of the development process—brigades remained concentrated only in centers with sufficient resources to support them.

[Excerpted from Non-Formal Education in African Development. New York: African-American Institute, 1972, "Major Case Study No. 2: Botswana: Brigade Training," pp. 65-74.]

Out-of-School Education for Rural Kenya

Walter Elkan

[Most Kenyan youth end their education with primary school, a situation which neither prepares them well for rural modernization nor ensures that they will retain what they once learned. A nationwide network of Youth Centers is proposed to provide low-cost extension of basic learning plus an acquaintance with the use of tools.]

A major problem facing Kenya is that for a great majority of those who leave primary school there is no further education of any kind. It is estimated that some 150,000 leave primary school each year, of whom not more than 30,000 go on to secondary school or receive some other form of further education. This is a problem for two reasons. First, it is perpetuating the shortage of people with intermediate skills in a wide range of occupations extending from farm mechanics to catering staff. Second, there is a danger that what was learned will shortly be forgotten when education ceases completely after only seven years of school. The first of these problems might be called the "manpower problem" and this article will have little to say about it. I am concerned here primarily with the second problem, the lack of provision for "topping up" and extending what has been learned at primary school. It is a waste of scarce resources to give people a primary education unless what has been taught is retained, and it almost certainly will not be unless steps are taken to ensure that it is. In addition, Kenya is anxious to see the economy of its countryside transformed and "modernized." But such

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transformation and modernization require the wide dissemination of aptitudes, both intellectual and manual, for which seven years of school, often in rather difficult conditions, cannot have done more than lay the foundations. Modernization of the countryside, of course, is not simply, or even primarily, to be achieved through education or training. That requires a great many other inputs, and it also requires the pursuit of economic policies which provide the right incentives and recognize and overcome the barriers to action. But it is fairly clear that one such barrier is that the great majority who live in the countryside lack the basic endowments needed for faster progress.

Rural progress is too slow to satisfy young people and their one ambition in life is to find a job in town. Very few succeed. The prospects of finding a wage job will probably be a little better in the coming years than it was during the 1960s when such employment virtually stagnated. The development plan for 1970-74 aims to increase wage employment by 5.1 percent a year. Between 1968 and 1974 the number of wage earners is expected to increase by 375,000 from just over 1 million in 1968; of this increase, 200,000 jobs are planned to be outside agriculture. But even if the employment objectives of the plan are attained, it will still only be a minority who find jobs in the towns. The current rate of population growth is adding 126,000 persons to the labor force each year. The plan estimates that during the period 1970-74 the numbers leaving school at the end of a primary education will have been over half a million, and 138,000 more will have left secondary school. It estimates that less than half the secondary-school leavers will have found urban wage jobs and that virtually all the primary-school leavers will have to find their livelihood in rural areas, only a few of them in wage employment.

What are the implications of this? First, since wage employment is so keenly sought after and so scarce, further education and training are universally regarded as the way to fulfill one's ambition. When employers have a vacancy they tend to fill it, in the absence of better criteria of selection, with whoever can produce the most certificates. This emphasis on formal qualifications or certificates then also leads to the erroneous but widespread belief that it is only the lack of the cherished certificate which is responsible for continued unemployment. Secondly, all post-primary education and training is either focused on wage employment, or tends sooner or later to be diverted in that direction. If only the focus were explicit and really sharp, it might at least go some way towards solving the "manpower problem" referred to earlier, but in practice the educational system oversupplies youngsters with a purely "arts" education, while shortages of people with more specialized training, and especially with certain manual skills, per-

sist. An even greater shortcoming is that post-primary education and training at present make little contribution to rural development, although this is one of the major objectives of the development plan and of government policy.

A transformation of the countryside requires educational inputs of two kinds. First, it will need proper training for the next generation of small-scale farmers as envisaged in the development plan. There will also be a need for properly trained rural craftsmen, tractor drivers, maintenance mechanics and so forth. This type of training can necessarily be provided for only a minority except perhaps for short courses at Farm Training Centers. But rural transformation also requires a lifting of the general level of competence in the countryside, and this means that it may be equally important to make some provision for the great majority who will never obtain specific vocational training. This provision for the majority should have two principal ingredients: first, the maintenance of skills acquired in primary school—literacy, and the ability to calculate; and secondly, the teaching of manual skills of the kind that are almost universal in industrial countries irrespective of people's occupation—the use of simple tools and the maintenance of equipment such as bicycles.

An Educational Strategy for Primary-School Leavers

In arriving at a strategy for providing further education for primary-school leavers who will not go to secondary school or receive vocational training, certain constraints are overriding. First, the development plan makes it clear that rural development is to be given overriding emphasis. I shall therefore confine myself to proposals for rural areas. Secondly, expenditure on education is already very high: expenditure on formal education has been estimated to be about 7 percent of gross domestic product (GDP) and 20 percent of the combined recurrent expenditure of central and local government. No proposal is therefore likely to be practicable which is costly to implement. In order to make provision for large numbers, low cost in terms of both finance and trained staff is the only hope of rapid progress.

Within these constraints what kind of post-primary education should one provide? As was argued earlier, it needs to do two things: first, to "top up" what was learned at school, and secondly, to add manual skills by providing the opportunity to use simple hand tools like hammers, saws, screwdrivers and sewing-machines. To do this for large numbers at low cost implies that the education can be provided only on a part-time, non-residential basis, and that there will have to be about as many establishments in an area as there are primary schools, given that the number of primary schools

is determined by the length of the daily journey to and from school. Finally, it will be advisable, if possible, not to create new institutions, but to reform existing ones or to graft new functions onto them.

Village Polytechnics. One project that has been widely discussed is the setting up of Village Polytechnics. Originally proposed by the National Christian Council of Kenya in 1966, about 20 such institutions have since come into existence with an average enrollment of 30 each. Their aim is education for self-employment, or to teach young people skills with which they could earn a livelihood in the countryside. The skills range from bee-keeping to tanning hides or building houses, and the idea is that each Polytechnic should make an assessment of opportunities in its locality and then train people to take advantage of them. In practice there is a heavy concentration on carpentry, bricklaying, tailoring and leather work, although bicycle and watch repairing are also taught. The courses last two years, although many of the students leave earlier if they find an opportunity of earning money before they have completed the course; some reappear later to receive further training.

The Village Polytechnics so far established have all been the result of initiatives taken by one or other Christian mission. The local churches have mostly provided land and initial equipment and the missions are bearing a major part of the cost. They have in some instances provided the instructors, while in other cases young volunteers from overseas have played a leading role. There is great diversity in almost every respect, and the annual recurrent cost of running these institutions varies accordingly between $31 and $143 per student with typical figures of $70 to $84 per student. This compares with an average of $22 per pupil in primary schools and $126 to $140 per pupil in rural secondary schools.

While it is to be hoped and anticipated that Village Polytechnics will spread and prosper, it has also to be recognized that they face a number of problems. First, they have so far been very dependent on Christian missions and overseas volunteers, and this dependence must inevitably limit their spread. Secondly, while there may be a great need for rural craftsmen the effective demand for them can easily be exaggerated. So long as the Village Polytechnics only produce a small number of craftsmen there is not much danger of a glut, especially if some of them combine practicing their craft with farming and other ways of earning a livelihood. But many market centers in Kenya already have bicycle mechanics and watch repairers, not to mention contracting carpenters and masons. Thirdly, the idea that after two years in a Village Polytechnic a youngster is equipped to start up his own business is surely a little naive. Even if he is given some elementary introduction to bookkeeping and as-

sociated arts it is unrealistic to imagine that this is all he needs to make him a successful businessman. Despite the talk of "education for self-employment," the Village Polytechnics are still seen primarily as helping their students to find paid wage employment. Finally, the cost per pupil of providing a place in a Village Polytechnic must rule this out as a way of providing further education for the majority of primary-school leavers.

Youth Centers. Village Polytechnics are essentially part of the "formal" or "school" structure of education. But if low cost is to be a crucial criterion, then it almost inevitably points to the desirability of making provision for primary-school leavers on the basis of "out-of-school" (i.e., non-formal) education. This term is used to comprise various activities ranging from literacy classes, via instruction given at Youth Centers, to part-time courses at Polytechnics or evening classes, agricultural extension work, correspondence courses and perhaps even instruction in family planning. The current extent and costs of non-formal education in Kenya are difficult to assess. In the case of formal education we know the numbers of pupils in primary and secondary schools each year and their rates of increase. For out-of-school education, however, there are no comparable figures of numbers receiving instruction or for expenditure. This is hardly surprising in view of the heterogeneity of non-formal education and the fact that while formal education is largely the business of one ministry—the Ministry of Education—non-formal education is not.

I argued earlier that the need to keep costs to a minimum meant that one had to think of some way of providing further education on a part-time and non-residential basis, preferably by building on existing institutions. It seems to me that the best way to achieve these aims is to graft what is proposed on to the existing Youth Centers. The role of these Centers has already changed somewhat over the years, and it may be made to evolve still further. Originally started by the British Administration during the Mau-Mau emergency, they were intended to provide young people with something to do that would remove the temptation to join Mau-Mau for lack of alternative occupation. Later, they were recast to provide exactly the kind of "topping-up" of primary education that is proposed here, but for a younger age group, in the days when most children had only four years of primary education.

Today there are some 170 Youth Centers attended by an estimated 13,000 young people aged 7 to 20, of whom rather more are boys than girls. They are the responsibility of the County Councils, which provide their buildings, staff and equipment, though some of the buildings have been put up by villagers themselves under self-help schemes. Their object and functions are not very well defined and indeed a salient characteristic of the Youth Centers is their extreme diversity. At

their best they provide just the kind of further post-primary education I am advocating—a mixture of conventional reading, writing and arithmetic, and an equal amount of time spent on practicing the use of simple tools. But this latter and most important part of the whole is most often in abeyance, usually for lack of money to buy tools; few County Councils seem able or willing to keep the Centers supplied. The only well-equipped Centers seem to be those which had received their tools as gifts from UNICEF, the Dulverton Trust (an English foundation) or the Save the Children Fund. One County Council—and perhaps there were others—supplied timber and other materials from a revolving fund, created by the sale of the youngsters' work. Because they depend so much on charities for equipment, it tends to be only the newest Centers which are well equipped. Eventually equipment wears out, is lost or stolen, and then this side of the Centers' work atrophies.

There is also great diversity in the ages and previous experience of those who attend them. Some are small children, while others are in their early twenties. Most commonly, the Centers seem to be providing a kind of primary schooling for youngsters who are not attending primary school, including those who have not been able to get into a primary school after the maximum age of entry was reduced and those whose parents prefer the lower fees of the Youth Centers. Although the Youth Centers are not supposed to accept children who are eligible to go to primary school, there is little doubt that some of them do. But as quasi-primary schools the Youth Centers are poor substitutes. Their staffs are less well paid and less qualified. They lack the guidance and supervision of the Ministry of Education as well as the textbooks and other materials which schools get from the Government. It would therefore be desirable if the Youth Centers were reconstituted to perform a distinct role and to do so properly. The Government has recently begun to do just that by designating some of them as Senior Youth Centers and confining them to genuine primary-school leavers. This should be done for all of them, and the less effective Youth Centers should be brought up to the standards of the best. This will mean ensuring an adequate supply of tools and materials, and altering the teaching of the academic subjects so that it continues where primary schools left off. The education provided by Youth Centers should not duplicate that given in the primary schools.

Cost Estimates

How many Youth Centers would be needed if the proposal in this article were fully implemented? Given that they must be non-residential, the numbers required must be approximately the same as the number of primary schools, which is now just over 6,000. There are at present only about 170 in existence, and most of these are in need of overhaul. The task of creating such large numbers of

Youth Centers may therefore seem daunting. But the buildings may well be provided by local self-help, or the Centers could be housed in existing buildings, including schools; the major capital cost is the provision of an intial stock of tools and materials at a cost not exceeding $280 per Center, or a total of $1,680,000. (A Center at Watuka, near Nyeri, was equipped by UNICEF in 1967/68 at a cost of $224, which should be fairly typical.) The more serious problem is posed by the recurrent costs.

Assuming that two thirds of school leavers continued to attend for the equivalent of one day a week for three or four years, each Center would probably need two or three full-time staff members—all of whom should be capable of helping with the teaching of reading, writing and arithmetic to allow flexibility in the allocation of teaching loads. They should also be capable of teaching at least one craft each at this pre-vocational level, and would be responsible for bringing in other instructors in the area on a part-time basis. The part-timers to be brought in would be local artisans who would supplement the craft teaching. Finding the part-timers will probably be easier than finding 12,000 full-time instructors, and it will almost certainly be necessary to rely on them for some years. It may also be necessary to set up a training institution to give short orientation courses of a few weeks' duration to prospective instructors (candidates must already have acquired their literary or manual skills elsewhere). The recurrent costs of all this are difficult to estimate realistically, but on the assumption that instructors are paid about the same as untrained primary school teachers, the total annual recurrent cost when 6,000 centers have come into existence is not likely to exceed $8.4 million a year. If they cater to 300,000 school leavers, this would mean a recurrent cost of $28 per person enrolled. This should be regarded as an outside estimate, and is in any case intended as a rought order of magnitude when all the Centers have come into operation. It will almost certainly be necessary to bring the Youth Centers into operation gradually over a period of three or four years; initially the cost would be less. The estimate assumes that any materials required will be paid for by the users; this is best done by charging everyone a small fee to cover the cost of materials and maintenance of the stock of tools and other equipment.

[Condensed from "Out-of-School Education and Training for Primary-School Leavers in Rural Kenya: A Proposal," International Labour Review. Geneva: International Labour Office, Vol. 104, No. 3, September 1971, pp. 205-212 and 214-215. Reprinted with Permission. Requests to reproduce or translate should be addressed to the ILO, Geneva; French and Spanish editions available.]

Book Review

Paulston, Rolland G., Editor, Non-Formal Education: An Annotated International Bibliography. New York: Praeger Publishers, 1972; 332 pp.

Readers concerned with pursuing the subject of non-formal education in an effort to derive some systematic lessons from experiences around the world would do well to start with the bibliography compiled by Dr. Paulston for the University of Pittsburgh's Center for International Studies and its International and Development Education Program. It lists 875 publications in English, French or Spanish, with a paragraph or two of summary for each (except where summaries in other bibliographies are referenced). The editor has given as his definition of the subject and his criteria for selection:

"Although there is common agreement that the age-graded hierarchy of elementary, secondary, and higher education represents formal education, there is as yet little agreement as to what constitutes non-formal education....Non-formal education is here defined as: structured, systematic, non-school educational and training activities of relatively short duration in which sponsoring agencies seek concrete behavioral changes in fairly distinct target populations; it does not advance to a higher level of the formal school system." It may be distinguished from: "...informal education, in which people learn in a non-systematic manner from generally unstructured exposure to cultural facilities, social institutions, political processes, personal media, and the mass media." (p. ix)

"The criteria used to select items were as follows: relevance for operationalizing the conception of a distinct non-formal education sector; ability to illustrate non-formal functions, processes, and outcomes; the

recency of publication, although several older items have been included because of their appropriateness to the first criterion; and the need to limit the work, to be highly selective, and, at the same time, to include a variety of unpublished works, some of which are still in process." (p. xv)

The items included are indeed global in scope, covering both industrialized and developing countries including some socialist ones (e.g., items from Cuba, the USSR and China), and they appear to include some rather substantial surveys. Of particular interest to researchers and others who may be concerned over the amorphous quality of the subject area is the organization of the items into the following categories and subcategories, quoted from the table of contents (pp. xix-xx):

Chapter 1: Orientation and Basic Issues: critiques of formal schooling; conceptualizing non-formal education; planning non-formal education.

Chapter 2: Area Studies: national studies; regional studies; others.

Chapter 3: Organizations Conducting Programs: international; governmental and quasi-governmental; voluntary organizations; industrial and commercial; military; others.

Chapter 4: Target Learner Populations: infants, children, and youth; adults; communities; workers; paraprofessional, professional, and administrative; ethnic and disadvantaged; others.

Chapter 5: Program Content: agricultural; civic and community development; consumer and homemaking; cooperatives; family planning; health; industrial; literacy; others.

Chapter 6: Instructional Methodologies and Materials: audio-visual and mass media; campaigns, encampments, and labor; classes, seminars, and workshops; correspondence; demonstrations and extension; didactic and programmed materials; others.

Chapter 7: Reference Materials and Publications: bibliographies and directories; serials and periodicals; others.

EMPLOYMENT GENERATION

MEMBERS OF A COOPERATIVE
HOUSING GROUP AT WORK, PERU.

Reducing Structural Unemployment in Ceylon

Dudley Seers

[In 1971 the International Labour Office (ILO) World Employment Program undertook a study of ways to increase productive employment in Ceylon. The resulting report, similar to that from the first ILO pilot study in Colombia (see Development Digest, January 1971, pp. 114-124 and January 1972, pp. 94-109), is discussed here; employment of youth is emphasized.]

In the case of Ceylon as in Colombia, the underlying population increase creates a chronic problem of labor absorption. The reasons are somewhat different—Ceylon is a classic case of a dramatic population explosion following malaria eradication—but the consequences for unemployment are similar, and so are the implications for population policy. Technology is biased towards capital intensity in Ceylon, just as in Colombia, and for much the same reasons—an overvalued exchange rate for capital goods, interest rates which are too low, tax treatment which is too generous to investment, and perhaps above all, lack of controls on the introduction of foreign technologies that involve heavy foreign exchange costs. In Ceylon, as in Colombia though not quite to the same extent, the existing pattern of land use stands out as a major obstacle to employment creation. It is difficult to imagine how rural areas in either country could absorb a significant fraction of their own population increase without some redistribution of land. Smallholdings are more intensively cultivated than large ones, generating both more output and more labor use per acre. So here too land reform appears to be

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a virtually inescapable condition for a high level of employment. Although data on income distribution in the two countries are extremely weak, they suggest a much greater degree of equality in Ceylon: in Colombia the proportion of pre-tax income in the hands of the top 5 percent is 30-40 percent; in Ceylon, about 20 percent.

Educated Unemployed

The main novelty of the Ceylon report is the attention paid to structural unemployment—although there is indeed a global shortage of work, and unemployment would be severe even if the structural difficulties I am going to describe did not exist. The results of a recent socio-economic survey had a big impact on our thinking. They showed a high level of open unemployment—about 14 percent, much the same as in the cities of Colombia. They also revealed a close relationship between unemployment and both age and level of education (see Table 1). Unemployment is staggeringly high in the younger age groups, particularly among those with O-level (secondary school) qualifications. This must have been among the causes of the insurrection in April 1971.

Table 1: Ceylon: Open Unemployment by Age and Educational Level

(those seeking work as a percentage of labor force)

Level of Education Reached	Age Groups			
	15-19	20-24	25-34	35-44
None	23	8	6[a]	1[a]
Primary	34	15		
Middle	46	39		
Secondary (O-level)[c]	92	63	17[b]	6[b]
Secondary (A-level)[d]	—	69		

a/ all persons lacking O-level certificates.
b/ all persons with at least O-level certificates.
c/ O-level examination equivalent to high school graduation.
d/ A-level examination intermediate between O-level and university degree.

SOURCE: Socio-economic survey of 1969-70 (first round), unpublished; Ceylonese Ministry of Planning and Employment.

In fact manual jobs are available, especially at harvest time, which the educated unemployed will not take. We do not know how many vacancies there are, but clearly some are difficult to fill, the most striking piece of evidence being that, despite more than half a million open unemployed, the Government in 1971 decided to bring

in several thousand workers from India for toddy-tapping and other field labor—a curious echo of the importation of Indian labor for the coffee, tea and rubber estates during the 19th century.

We emphasize the contrast between work expectations and opportunities in the title of the Ceylon report. In brief what seems to have happened is that the expansion of the educational system has out-run the capacity of the economy to provide the sort of jobs that those with secondary school qualifications feel they are entitled to expect—broadly speaking, office jobs. This divergence raises a big question mark about the nature of the education being provided. The educational system of Ceylon emphasizes examinations which lead to further schooling and further examinations. The primary school is devoted to preparing pupils not for farming work, which will be the actual occupation of most of those who leave school, but for secondary education. It is—in view of the rates of dropout—a very expensive means of doing this. The secondary school prepares its students for O-level and university entrance. It is difficult to know whether more damage is done to the great majority who suffer the frustration of failing a crucial examination (usually after repeated attempts), or to those who succeed in passing them all. The latter have been conditioned to look on learning as a means of gaining not the knowledge to do a job, but the opportunity to get one. Not surprisingly, they consider their eventual post as the due reward for years of cramming.

This problem is bound to get worse. By 1985 about three quarters of the entrants to the labor force, on present plans, will have had some years of secondary education. The need for educational reform is therefore urgent. We suggest steps to get away from the "sequential" system, partly by putting much more emphasis on practical studies and on aptitude tests, and partly by requiring young people to break their education with productive jobs, especially in the period between leaving school and entering university. Everyone in fact would be able to apply for a period at a university, normally returning to their workplace after graduation. But even such far-reaching educational reform would not be enough in itself; it needs to be supported by lower salary differentials and fringe benefits (such as subsidized housing and transport) for clerical and administrative work, especially in the civil service which to some extent sets the pattern for the country. There are signs of these differentials declining already but far too slowly to change the attitudes of the present generation of school leavers. The only way to reduce the fascination of the white-collar job for the young is to make an office career much less attractive. Yet it would cause hardship and raise political difficulties to cut existing salaries. We felt that new entrants to the civil service should be placed on a salary scale that was lower all the way up.

Unemployment on the estates. In Ceylon, a second major type of structural unemployment can be found on tea (and rubber) estates, where a population of Indian origin is employed at low wages even allowing for free housing, often part time, but with very little prospect of jobs in other sectors of the economy. Linguistic, social and communal barriers to labor mobility are not unknown in other countries, but the consequent overcrowding of one sector is rarely so severe as it is in Ceylon. There is little prospect of expanding employment on the estates, so the future of unemployment there depends very much on the speed of implementation of the Ceylon-India agreement of 1964, which provides for the bulk of this labor force to be either repatriated to India or given Ceylonese citizenship. So far there has been rather slow progress under the agreement.

The Policy Dilemmas

The Ceylon report shows the magnitude of the policy effort needed to reach a high level of employment. It is not at all easy to solve problems which have accumulated over the years. The economy has failed to expand and diversify anything like as fast as is required by the growth of population and by the increasing educational and welfare services, including the rapidly rising expenditure on subsidizing rice. Ceylon has not been responsive enough to developments in the world economy, particularly the sharp deterioration in her terms of trade. While one symptom of the lack of balance between social and economic progress has been large-scale unemployment, another has been a chronic balance-of-payments deficit, which has been running at over 5 percent of gross national product (GNP) despite tight exchange and import controls, causing very heavy short-term debts to pile up. The two symptoms are linked. The lack of foreign exchange keeps industry short of materials and spare parts. In Ceylon, as in many other countries, both these imbalances have to be corrected if a high level of employment is to be reached. This requires a big effort to develop new exports—both industrial products and more highly processed forms of traditional exports. It also requires concentrating investment on sectors with low foreign exchange requirements per person employed.

The Government specifically asked us to work out the conditions for a rapid reduction in unemployment, a need given added emphasis by the 1971 insurrection. Then the policy choices look especially severe. We took as a starting point the production and employment targets in the draft official plan for 1972-76 and came to the conclusion that special measures would be necessary, additional to those in the plan, if unemployment were to be brought down to moderate levels by 1976. These measures would include a large-scale rural public works scheme, which would supplement and support the land reform we proposed, by building the rural infrastructure needed. Smallholders would be given firm offers of employment under the

scheme if they agreed to rent out their land; the land thus released would help the authorities to put together viable farming units. Estate workers and the landless could also be given jobs under this scheme. But such opportunities would hardly satisfy those with secondary school certificates. We suggest that some of them might be absorbed in a big expansion of the para-professional labor forces in education and health. Improvements in these services are needed, especially in rural areas, to back up agricultural expansion, apart from reasons of welfare and employment.

We also suggest a national youth service. This would not be a grand scheme for youth camps (though these might be established too). Young people would be considered to be "in national service," and would, during their first three years of employment, be paid at a rate related primarily to their age, not to their educational achievement, whatever they were doing, whether working in an organized youth camp or in the civil service or for a public corporation or private employer. However, employees would have to pay the difference between this wage and the normal wage for the job into a fund to finance training. Participants in organized youth schemes often feel underprivileged; a universal wage scale for all young workers should help remove such a feeling. It would make possible a big expansion of youth employment; it would also encourage young people to create forms of self-employment (in which their incomes would not be limited). Finally it would make it easier to introduce the lower salary scale mentioned above for new entrants to clerical and administrative grades—and it might well set the stage for some reductions in the salaries and fringe benefits for those already in public service, especially at higher levels.

Implementing an employment program of this magnitude and correcting the foreign deficit will require a very large fiscal program. Although foreigners who suggest a reduction in the rice subsidy take on a great responsibility, it is difficult to see how a substantial reduction can be avoided since Ceylon still depends heavily on imported rice. Our report suggests that the money saved in this way should be spent not only on employment creation but also on more selective measures to help the vulnerable sections of the community (young children, those on national assistance, etc.). The result could be to raise, not lower, welfare. Another part of this package would be increased taxation on the rich, and an increase in the premium paid on imports of goods other than foodstuffs, so as to remove hidden subsidies on capital equipment and non-essential consumer goods.

While wage restraint would be needed in a long-term employment strategy, it would have to be much tighter if a high level of employment were to be reached in five years. In fact, virtually all of the rise in consumption would be absorbed by those newly employed and no increases in real income would be possible for those at present

in jobs; indeed, for many in clerical and administrative jobs, a decline is indicated. The effect would be mitigated for some of those with jobs by removing the need to support unemployed members of their household. But still, it would be a hard policy to implement, requiring the cooperation of workers' organizations and machinery for setting norms for wage increases.

To list the requirements of a rapid move to full employment is to show how difficult a task it is. I do not think however that we should for this reason have simply said that it was not politically feasible. This is not for us to decide. We answered the question put to us: what would be required to achieve a high level of employment? The severity of the answer reflects the severity of the problem. In our policy suggestions, we accepted the socialist objectives of the Government; but any type of government would have to carry out far-reaching structural reforms and require sacrifices in the same circumstances. The results of our study may be of interest to other countries suffering from chronic unemployment, especially if much of it consists of people who have had a good deal of education. Whether the government—of Ceylon or any other country—puts such a program into effect boils down to a question of how high a priority it gives to the reduction of unemployment, and whether there exists a sufficient basis of political support for measures to achieve this.

The burden of these measures would be very heavy indeed if the rest of the world did not make a bigger effort to help. A country as highly dependent on imports as Ceylon needs relief from the foreign exchange constraint on growth if large-scale unemployment is to be reduced. This is in part a matter of trade measures—achieving a proper long-term international tea agreement, selling tea in more highly processed forms, increasing exports of coconut products, exporting manufactures. While these require Ceylon herself to adopt new policies in various fields, they also require a much more constructive approach by her trading partners. It is also a matter of aid. The aid received by Ceylon has been very small compared with the effect of the serious deterioration in her terms of trade. Some of it has been extended at interest rates which Ceylon is not likely to be able to pay (except out of more aid), and it has never been guaranteed sufficiently far ahead to provide a basis for planning fundamental solutions.

[Condensed from "New Light on Structural Unemployment: Lessons of a Mission to Ceylon," International Labour Review. Geneva: International Labour Office, Vol. 105, No. 2, February 1972, pp. 99-108. Reprinted with Permission. Requests to reproduce or translate should be addressed to the ILO, Geneva; French and Spanish editions available.]

The Role of Public Investment in Employment Promotion

N. T. Wang

[Although unemployment is a serious problem in many developing countries and will probably be increasing in the 1970s, current methods for solving it face serious obstacles. A fruitful approach would be to use public investment in conjunction with some form of National Service to make possible large scale, useful projects at reduced cost.]

One of the most important lessons of the First United Nations Development Decade is the inadequacy of a global target of growth for the developing countries. This is not to deny the crucial role of a high rate of overall growth, which reflects changes in production performance and increases in the availability of necessities and amenities of life; but employment is no longer assumed to be automatically determined by growth. It must be examined explicitly and in its own right. Although conceptual and measurement difficulties have prompted controversies over the precise nature and size of unemployment and underemployment, overt or disguised, in developing countries, there is little doubt about the massive extent of these problems and their growing seriousness in many of these countries.

On the supply side the high rate of growth of population is fairly well documented. For developing countries as a whole it increased from 2.3 percent per annum in the 1950s to 2.7 percent in the 1960s and is projected to reach 2.8 percent in the 1970s. Although

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the rate of growth of working-age population was somewhat lower in the 1950s and 1960s than that of total population, it is expected to accelerate and reach the overall rate of 2.8 percent in the 1970s. While this acceleration of growth is observable in all regional groups among the developing countries, there is a discernible tendency for a general convergence toward the 2.5 percent rate. In terms of absolute numbers, some 200 million jobs will have to be created in the 1970s if new entrants into the labor force are to be accommodated. It is most unlikely that either the modern sector or the industrial sector can absorb such a number. Even if the rate of growth of employment in these sectors is relatively high, the absolute number is limited because the base is as yet very small in almost all developing countries.

Conditions in the developing countries are not altogether uniform. In a few countries unemployment and underemployment are no longer major problems. Moreover, in most developing countries, overt unemployment is largely limited to the modern sector and not quite applicable to the traditional sector, which continues to dominate the scene. In some cases reported unemployment may include the temporarily unemployed, since the duration of unemployment is hardly ever specified. Nevertheless, evidence is accumulating to lend support to the contention that the employment problem is common to many developing countries and is growing worse in most of them. The problem is most evident in many Asian and Caribbean countries, where population pressure has long been known to exist. In Ceylon, India and Pakistan, for example, the unemployed are frequently as much as 10 to 20 percent of the labor force. A very high ratio of unemployment has also been estimated for Guyana, Jamaica and Trinidad and Tobago. The problem in Latin America and Africa, where factor endowment is generally more favorable in relation to population, is a more recently exposed phenomenon. In Colombia, for example, over unemployment has been judged high (14 percent of the 1967 urban labor force), and when the full-time equivalent of disguised unemployment is added, the ratio is over 20 percent. Moreover, the total pool of surplus labor has tended to grow over the years. In Ghana the size of unemployment is estimated at about 600,000 out of a labor force of 2.5 million. In Kenya, although no unemployment statistics are available, the number of unemployed is known to be large and growing.

The Inadequacy of Existing Approaches To Employment Promotion

The most obvious shortcoming in employment policy is one of omission rather than commission. Although most developing countries have now adopted multi-year economic and social development plans, few have a clear-cut formulation of employment policy. In a number of countries where the problem is known to be serious, polity

dictates that both the nature and extent of unemployment should not be publicized in order not to embarrass the government. The secrecy on the extent of unemployment has the effect of inhibiting efforts for a better understanding of the problem and serious discussions on measures for dealing with it. Few development plans have laid down specific targets for diminished unemployment. This reluctance to face the unemployment problem squarely is especially encountered where prospects for any significant improvement are poor within the horizon of a plan period of four or five years. It is extremely difficult for a government to admit that during its plan period unemployment would remain at a very high level or even increase.

Yet it is equally clear from an examination of available development plans that few significant improvements in the projected employment situation are discernible. In countries where the rate of increase in employment envisaged in the plan is about the same as or lower than that of the labor force, a further deterioration is likely. Even in the few cases where the planned increase in employment is significantly higher than that in the labor force, the improvements may not match the magnitude of the problem—not to mention the question of the likelihood of fulfillment.

From the point of view of development strategy it is often implicitly assumed that the maximization of the growth potential of the economy is also the best strategy for employment. This is probably not far from the truth in the very long run. The best defense of this contention is that the developed countries today have by and large solved the employment problem. In the relatively short run, however, it should be realized that growth is not necessarily accompanied by increased employment. This is most evident where growth is propelled by modern technologies molded to suit the conditions of developed countries. Thus in petroleum-producing countries such as Libya and Trinidad and Tobago, copper-producing countries such as Peru and Zambia, and bauxite-producing countries such as Guyana and Jamaica, rapid growth of the economy is entirely consistent with sluggish growth of employment and lingering unemployment, since the rapidly expanding sector requires little labor and there may be real limitations in the degree of technological flexibility in employing more labor. Even in agricultural development there are numerous instances in Latin America and Asia where modern equipment requires precious little labor as a complement to production. Quite apart from purely technological considerations, entrepreneurs frequently prefer modern equipment to labor because the former is easier to manage and entails less uncertainties.

Recognizing that employment may be insensitive to growth, the advocates of employment-through-growth would still argue that as long as the relationship is positive, the solution to the employment

problem lies in the acceleration of growth. The basic difficulty with this proposition lies in the maximum feasible rates of growth under various constraints in the internal as well as the external sectors and in strategic scarcities. Thus, for a given developing country, it may be feasible to accelerate the rate of growth from 5 to 6 percent a year, say over a period of a decade, but it may be increasingly difficult to accelerate the rate further to 7 or 8 percent without running into intractable difficulties, which are only too familiar in so many developing countries. Moreover, even in cases where a very high rate of growth is indeed achieved, it may be precisely because growth is brought about without employment.

The practical unfeasibility of solving the employment problem through growth beyond a certain point has prompted some fundamentalists to attack from the population side. Unfortunately, this approach confuses the long-term goals of a demographic and environmental policy with an urgent employment policy. Those who will be entering the labor force in the next ten years have already been born and have a high expectation of survival for that period. Yet another fundamentalist approach is to attack the foundations of the socio-economic system and the entire cultural and institutional framework. There can be no basic dispute that unemployment could be eliminated under alternative systems; the question is whether there are other objectives which are as important as employment and other means which are more congruent with the accepted values and practices. Within a predominantly market economy various fundamental changes are of course needed to deal with the employment problem. Numerous contributions to the theories of development all touch on the removal of some key obstacles, ranging from the structure of production to exchange rates and domestic and foreign saving and the need for land reform and shifts in income distribution. The weakness of such a comprehensive and fundamental approach remains that in the course of a few years it can hardly be expected to achieve significant results in view of the gravity and stubbornness of the problem. A crash program appears to be necessary for the immediate future.

It is the contention of this paper that a more direct and less conventional approach is required. At the same time the orientation has to be economic and developmental, so that it is consistent with long-term goals. Thus, a social policy such as a guaranteed minimum income or massive unemployment benefits through social insurance can be rejected out of hand for most developing countries simply because a reasonable income level is not even attainable for those who are productively engaged.

A general policy to encourage labor-intensive activity has much appeal, especially on the ground that there is a divergence of market costs of capital and labor from their social costs. Yet there are real

difficulties and even dangers in formulating and implementing a policy of promoting labor intensity. In the first place, the concept of labor intensity is operationally ill-defined. At a micro-level, it is by no means valid that a capital-intensive activity should receive low priority. It may be precisely such an activity that is crucial to the development of the rest of the economy. It is not the amount of labor in a particular activity which matters; it is that amount together with all the employment which is made possible by that activity. For instance, the building of a dam may be highly capital-intensive, but the additional land thus brought under irrigation may enable the farmers to engage in more intensive cultivation in addition to the jobs in industry and services which may be created by the new electricity. An evaluation of all the secondary and tertiary effects, however, is extremely uncertain, and when the statistical basis is weak it is usually no more than a reasoned guess. Certainly labor-saving machinery should not be universally condemned. In the case of activities for which international competition is keen, the test of efficiency and productivity is obviously supreme: not only low unit costs but also the ability to deliver goods of uniform quality, in quantity, and with speed are essential. Frequently, it is the saving of critically scarce skilled labor and managerial time that counts. For instance, a road maintenance program is facilitated by automatic photographic recording of road conditions because the device will save the time of road engineers in initiating needed repairs. An engineer-saving piece of equipment is thus common-labor using.

There are thus severe practical limits in reordering priorities in favor of labor-intensive activities. In particular, the use of shadow prices to encourage the use of labor is difficult to implement. Indeed, the use of certain rules of thumb advanced by some planners, whereby orders of priority are mechanically related to labor intensity (for example, by a point system) may actually be misleading. At the inter-industry level this is sometimes used to discourage investment in so-called heavy industries without any realization that some of these industries may be crucial in imparting dynamism to the growth of the entire economy and redressing the imbalance in the traditional structure of industries. Arbitrary measures to increase employment, such as directives to enterprises on the maintenance of a minimum number of employees, or negative employment taxes, border on the encouragement of waste and redundancy.

The Strategic Role of Public Investment Projects for Employment

It is clear that the grave employment problem in many developing countries is unlikely to be solved in the coming decade or so, whether by fundamental structural transformations, accelerated rates of growth or marginal adjustments in factor inputs. It is indeed ex-

tremely unwise to give false promises of full employment in a relatively short period of time. In most cases, it is even unrealistic to set precise quantitative targets for reducing unemployment. As most practitioners know, the exact number of the unemployed is spongy—when work is found for some of the urban unemployed, the ranks are often filled by the underemployed from rural areas. Extravagant promises are not likely to be fulfilled, and will sooner or later provoke violent reactions. Yet the paradox remains that there is so much work to be done and so much labor without work. It is the inability of the market mechanism to bring them together that is at fault. Intermediate between minute improvements in the functioning of the market mechanism and complete abandonment of it in favor of direct allocation of resources, as in wartime or collectivist economies, there are approaches which are congruent with, or at least tolerable in, the current political and social milieu and yet sufficiently powerful in relation to the magnitude of the problem.

The most potent policy at the disposal of government is its own investment program. In the first place, it is generally recognized that, irrespective of the social system, many areas of investment benefit the economy as a whole and are eminently suitable for public programs. Few would question the propriety of the government in engaging in road construction, irrigation, water control, land reclamation or reforestation. Indeed, investment by general government and government enterprises has often accounted for about a third or more of total domestic fixed capital formation. When investment by public corporations is added, the ratio is sometimes as high as one half. In the second place, the public sector is already a major employer and is an area where the rigors of the market are less applicable. It is possible to give more weight to social cost and benefits than purely market calculations would allow without the elaborate system of compensatory arrangements required in the shadow pricing of products which compete their way into the market. Furthermore, the resources may be mobilized by tax power.

Yet it is evident that most public investment programs are not oriented toward employment creation. Indeed, few of these programs carry out any estimate of employment implications at all. This is partly due to the occupational bias of dinanciers, cost accountants and engineers, and partly to the fact that public works departments are usually ill-suited to handle mass employment programs. When the job is carried out by private contractors, the question of social cost hardly enters the picture. When the work is carried out by the government departments themselves, the ability to organize and manage a large number of workers is severely limited by the structure of the organization. Moreover, if a large number of the unemployed were to be put on the payroll of the works department, they would have to be paid in accordance with civil serv-

ice scales, which are often several times as high as average earnings for the country as a whole. The budget would be inflated to unmanageable proportions.

For the purpose of direct employment provision, it is often necessary to have a dual approach to public investment, separating the employment projects from the others. This is not to deny that all public investment projects will necessarily have employment implications, but it does reject the proposition that all public investment should be designed to provide maximum employment. Efficiency should still be the criterion of public investment in general. Otherwise, the employment of redundant workers and featherbedding, already widespread in politically motivated appointments and bureaucratically oriented management of public programs, would get out of hand. Moreover, it is an untenable proposition to insist that labor-intensive methods should be uniformly adopted. A public investment program might permit the use of the most modern technologies in, for example, the construction of certain trunk roads, and at the same time provide massive employment through the construction of feeder roads. If the soil conditions are such that a gravel surface is required, it might also involve mechanized stone-crushing plants. Thus, the emphasis on employment creation should not lead us to a return to primitivism, and conversely the acceptance of modern technology does not rule out the simultaneous application of age-old methods, possibly greatly improved with a modern twist. These possibilities are not isolated theoretical cases. They are pervasive in virtually all important branches of public investment, whether in road construction, irrigation, water catchment, land reclamation, canal building or reforestation.

It is not the difficulty of finding projects with a positive marginal product of labor but the practical difficulties of mobilizing the labor and finance that inhibit many governments from engaging in public investment programs for employment. A dual approach to remuneration is essential in overcoming this difficulty. Because of the dimensions of the employment problem, few governments in developing countries would be able to secure the necessary finance if ruling wages were to be paid. The employment of, say, half of the unemployed in countries where the unemployment ratio is 10 percent and the public sector absorbs 10 percent of the labor force would entail an expansion of public employment by 50 percent.

One approach to achieve duality in remuneration is to rely on voluntary contributions. This approach is typified by community development programs in which voluntary contribution of labor is aided by provision of materials and organizational assistance from the government. While the potentialities of this approach have not been seriously explored, despite widespread experimentation, its rele-

vance to the employment problem is likely to be limited. Basically, these programs are not designed to provide work for the unemployed; they are to provide extra work for those who are not fully occupied. The unemployed can hardly afford to contribute voluntary labor. Inasmuch as community development programs seek the voluntary contribution of labor for no more than a few days a year, their impact even on underemployment is limited. In Ceylon, for example, whose rural self-help, or Shramadana, has been a tradition, voluntary contribution is not expected to be much more than seven days a year. A strictly voluntary principle at the local level, moreover, is severely limited to the few types of projects for which local leadership and rural unskilled labor possess the know-how and interest. Thus, in self-help housing programs, there is usually a critical shortage of skilled builders once a reasonably high standard is set. Very soon the practical projects are exhausted and the organizational overhead is wasted.

An alternative approach to duality in remuneration is by means of conscription. This is best illustrated by the armed forces, in which the conscripts not only contribute their services but also risk their lives at a consideration usually substantially below market scales for less onerous work. The absorption of a sizable proportion of the able-bodied into the armed forces in Korea, for example, contributes significantly to the virtual disappearance of unemployment there [see Development Digest, October 1969, pp. 22-27, on servicemen's projects in Taiwan]. For civilian work, however, conscription is probably distasteful to most developing countries. It may be reminiscent of the forced labor in ancient times and during periods of enemy occupation. It may encounter strenuous popular resistance which may pose difficult problems of enforcement.

National Service as an Alternative to Unemployment

If voluntary arrangements of the community development type and full-scale mobilization by conscription are inadequate or impractical, an appropriate combination of the voluntary and obligatory principles for providing productive work and absorbing the unemployed might be devised in a new form of organization, such as a National Service. The degree of voluntariness could depend entirely on local circumstances. Thus, the National Service might be on a completely voluntary basis as far as participation is concerned, and the participants might be given food, clothing, shelter and possibly some pocket money. In contrast to a public target for full employment, it would admit substantial unemployment but provide a practical alternative to complete idleness and, perhaps, despondency. In contrast to relief work or make-work, it would be devoted to investment projects which are essential for development. In contrast to community development projects, it could provide year-round work for the unemployed, and

work could be carried out in a highly organized fashion with discipline. The benefit of the work need not directly accrue to the participant so that a wide variety of projects would be possible.

A first step in the organization of such a service would be to identify, at the national and local levels, a number of projects, such as feeder roads, canals, water catchments, dams, irrigation, reforestation, land reclamation, etc., which could be performed by relatively unskilled labor with a minimum of other inputs. At the same time, it should be emphasized that work must be carried out in a business-like manner, so that it would not drag on indefinitely with intermittent efforts, as in some self-help programs. The work force for specific projects could be aided by professional advice in supervision and planning, so that the roads built would not, for example, be washed out by rain, land reclaimed would not be inundated, etc. Moreover, a part of the work force could be mobile, so that it would not necessarily be glued to a particular community but could move from one area to another like an army engineer corps. In this manner, the experience gained in one project could be applied to another. Indeed, it would be possible to have an initial period of preparatory training, which would even be useful for ultimate absorption of the trainees into normal employment.

While some implicit social pressure may be involved in all voluntary programs, a purely voluntary National Service might not be sufficient in some cases. Even if the cost were minimized by voluntary contributions, the dimensions of the operations in countries where unemployment is massive would probably require vast financial expenditures. Overall consumption would need to be restrained in order to make room for the inevitable increase in consumption which would result from greater employment. There might be insufficient incentives for the skilled and educated to participate in the National Service, which would therefore be composed mainly of the unemployed and the unskilled.

Various ways of bringing about obligatory contributions are possible. A mild form of obligation would be for all government-supported students to work for a year or so with the National Service or its equivalent as a form of repayment; the practices in such countries as Ethiopia, Kenya and Iran are instructive. A similar obligation could be required of particular professionals as a condition for license. A broader base might be obtained by requiring some form of contribution from everyone in the working-age group. Broad participation by all social strata would raise the status of the National Service and remove the stigma usually attached to relief work. In countries where military service is a tradition, at least a portion of those eligible for service could be allocated to the National Service. Such an arrangement would improve equity, since

no exemptions on moral or physical grounds would be necessary and deferments would not be a back door to evasion. In countries where military service is not an established practice, several choices could be offered: one would be to volunteer for, say, two or three months' free service in a five-year period; another would be to contribute two or three months' income in the same period in lieu of service. The income might be defined as either actual or a standard established for broad categories, whichever is greater. The option of obligatory service or monetary contribution reaches the poor without imposing unbearable financial difficulties on them; it taxes the rich, but they are not singled out in an over-arbitrary way. A most important element is that the whole package can be self-financing.

Various refinements are possible depending on the precise objectives to be accomplished. If particular attention is devoted to youth, special youth services or youth camps might be established, where the training component could be especially high. This would not only give immediate relief to serious unemployment of youth but also prepare them for permanent employment by teaching them a trade not normally dealt with in formal educational institutions. In Jamaica, for example, the Youth Corps camps offer a wide selection of training programs, such as auto-mechanics, electricity, welding, farm mechanics, woodwork, catering, tailoring, shoemaking, barbering and farming. The educated could be mobilized for such purposes as literacy campaigns or community welfare.

The uncertainty as to the best form of organization, which is due to lack of knowledge of precise conditions and reactions, could be overcome by a series of pilot projects in specific localities, e.g., in depressed or disaster areas. A pilot project may take two or three years before it is in operation. An evaluation survey may take another two years. When pilot projects are limited to isolated cases, the whole program may soon be forgotten, particularly if the specific reasons for success or failure are not of general applicability. The pilot projects should thus be considered as a first phase of a major program to be expanded if the operations prove feasible. For example, if the unemployment rate is 15 percent, the pilot phases might attempt to deal with, say, 2 or 3 percent, not an insignificant number. They should have built-in machinery for collection of information on the nature of the unemployed and their attitudes, and for continued evaluation and redesign of the projects as experience is gained.

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PEST CONTROL

WORMS IN AN EAR OF CORN.
[PHOTO: U. S. DEPARTMENT OF AGRICULTURE]

Pest Management

George L. McNew

[Pest hazards which cannot be wholly eliminated began with settled agriculture and are accelerating with the more intensive methods of cultivation. Since modern agriculture is here to stay, we must use our growing scientific knowledge to devise strategies for living with pest populations while minimizing their damage.]

Before one can speak authoritatively on "pest control," the nature of a pest infestation must be defined. We freely use such terms as disinfection, sterilization, disease resistance, environmental control, as though they were positive and complete. The horrible truth is that this is not so. We have brought pests under total control or eradicated them in so few instances that you can almost count them on your fingers. The harsh reality of the situation is that we must live with pests—be they insects, mites, snails, worms, fungi, bacteria, viruses, epiphytic plants, allergens, or weeds. Rarely do we eradicate them; the best we can do is to coexist with them. We and they are part of a giant ecosystem, and man is merely trying to shift the balance of power so he can exist in reasonable comfort and security.

As a general rule man has disturbed the natural ecosystem just enough to give the predators and parasites an upper hand. We set the stage for pests to prosper on the day we began to cultivate the soil so crops would be grown repeatedly in the same area, when we abandoned mixed vegetation and freely moving animals in favor of intensive monoculture and began to breed our crops and livestock to uniform

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standards of growth and physiology. Either man has to abandon agricultural pursuits or amend them by supplementary treatments. It is these amendments that we refer to as strategy for control. Perhaps it would be better to remember that it is our strategy for survival in competition with biological forces that we cannot crush or obliterate. We merely try to outwit their natural propensity for multiplication and to constantly readjust our strategy to their adjustments.

The Nature of Pest Infestation

There is nothing natural about our system of repeated use of the same space—be it a field, a barn, or a residence. We do these things because it fits our convenience and pleasure, but we must pay a price for every convenience. Time does not permit us to dwell on each household insect, each disease, and each weed problem, but if you will bear with me, I would like to draw upon an example from the field I understand best and you can apply the principles to almost any pest your mind's eye may focus upon.

When the European colonists brought the fine wine varieties of their native lands into the New World, they soon discovered that they were not "adapted" to their new home and died out within a few years, while the native wild grapes thrived. What they did not realize was that the extremely destructive downy mildew fungus had forced a status quo on the wild grapes. In desperation, the colonists began to select the better strains of wild grapes for table and wine. There emerged the Concord and other distinctive varieties of North American grapes. The progressive grape interests of France saw merit in these American varieties so they introduced them to Europe. They made the mistake of carrying with them the dreaded Phylloxera insect. Since the American varieties were resistant to this pest, they returned to America to obtain resistant root stocks. This time they succeeded in introducing downy mildew to southern France. The wine industry was wrecked in less than a decade, and its restoration was achieved only by the fortuitous discovery of the fungicidal value of Bordeaux mixture.

The basic principles of epidemics are clearly illustrated by this example. There is an evolutionary process in which parasite and host gradually come into a balanced state of resistance and aggressiveness by a natural process of selection. The mixed ecosystem guarantees that if extremely virulent strains arise among the disease-producing organisms they automatically eliminate themselves by eradication of host in that sector of the ecosystem, while constant pressure by other strains is upgrading host resistance elsewhere. It is utterly fatal to introduce a new crop variety that has had no evolutionary experience with a particular pest into an established population of parasites or predators. Introducing a new parasite of a given species into an established plantation of one of its hosts is another highly destructive act.

The Mistakes of the Past in Pest Management

Before devising a strategy for future pest management, it is well to consider the mistakes of the past. They fall into two broad categories—the errors of long-range strategy that have upset evolutionary balances, and the misguided tactics in day-to-day operations that have encouraged pest survival. It is only by learning from these that we can plan a strategy for the future.

We have been guilty of introducing susceptible varieties into an established population of pests. Ordinarily, this is not a major catastrophe since the variety is merely abandoned as unadapted, unprofitable, or inconsistently productive, depending on the seriousness of the maladjustment. However, if it has unique horticultural attributes as a crop or has other desirable attributes, it may be given special care and cultivated at great expense and demands upon ingenutiy. The much more serious economic problem is when a parasite or other pest is introduced into an established system where climatic conditions favor its multiplication. History is replete with such examples, and it fully justifies every effort at quarantine despite the inadequacies of such control.

The second great error in strategy has been to resort to intensive agriculture where monoculture of crops and crowding of livestock and man has proceeded apace. Where a pest is introduced under these conditions, it spreads like wildfire by contact or near-contact, poor sanitation, and cyclic recurrence of favorable conditions. The use of crop rotations, careful choice of site, etc., are partial palliatives, but they are inadequate because of the basic crowding of susceptible plants or animals.

The scientist has compounded these errors of strategy by manipulating genes so that heterogeneity of populations is lost. There was a time when the heterogeneity of population was ensured by use of open-pollinated varieties of crop and use of rugged mixed breeds of livestock, but this has been lost by intensive selection, inbreeding, and hybridization. In a pest-free situation or even in a mild infestation, there is much economic advantage in using crops and livestock with genetic purity. The use of a single gene or a specific complement of genes to ensure uniform growth, maturity, and gustatory quality, or desired nutritional value is essential in our modern methods of agricultural management. Farm mechanization and livestock management could never have reached its present state had we not sought this uniformity. However, in so doing, we exposed our wards to an enormous hazard of attack from pests.

Even the breeding of crops for pest resistance increases this hazard. Plant pathologists have had three quarters of a century of

experience in this area; they now know the hazards to be faced, but they still have faith in the potentials of genetic resistance in crops. However, when resistance is bred into a crop, a single gene change in the parasite can render a uniformly resistant variety uniformly susceptible. For example, in breeding into oats the Victoria gene for hypersensitivity to numerous races of crown rust, they created uniform susceptibility to a minor disease-producing organism of grasses. It came perilously near to eradicating oat culture before the Victoria gene could be replaced. Also, incorporation of a gene for male sterility into breeding stock of corn hybrids set the stage for another species of pest to severely damage the U.S. corn crop of 1970. The lessons are obvious; genetic purity is a wonderful thing but it is hazardous.

Among our problem-creating situations, there are many soil management practices that have intensified pest control problems. Force-feeding of plants renders them more susceptible to the attack of highly specialized parasites such as the downy mildews, powdery mildews, and rusts. An excess of nitrogen is almost uniformly deleterious to disease-escaping and disease-resistant attributes. A proper balance of nitrogen and phosphorus is a strong contributing force to escaping full impact of some of the less highly specialized parasites, such as the root-rot diseases. About the only situation where good crop growth and parasite resistance coincide fully is when potassium supplies approach optimum. The tendency toward feeding soils heavily early in the season so as to establish reserves for the crop throughout the season may create an unfavorable condition for seedling blights and promote early establishment of root-rot diseases which can do damage later.

The intensive cultivation of crops and the failure to restore organic material creates a hazardous condition by depleting the abundance and diversity of soil micro-organisms. There is little doubt that the attacks of some soil-inhabiting pests on other such pests contribute to their suppression. This has been clearly demonstrated by adding stimulants for bacterial antagonists, such as sugars, to soils inhabited by the strawberry root-rot complex or plant tissues to the soils dominated by the Texas root-rot fungus.

Strategy for the Future in Pest Control

Obviously, we have made many mistakes in the past. We should heed their lessons in planning for the future. Research has swept forward so strongly that there are opportunities on a hundred fronts that must be explored. In general, we now have a good picture of what the major pest problems are and we know a few things about their potential for change and adjustment. We know a great deal about their life habits, reproductive processes, and symbiotic rela-

tions. There is reasonable knowledge on the impact of environment on pests. A modest start has been made in determining the intricacies of biochemical processes and the response to exogenously applied chemicals, but most of the pattern remains to be filled in. Within the limits of what we now know, we may design a pattern on what seems logical.

The principle that must be faced before getting down to cases is that the human race must make a trade-off between multiple opportunities. There can be no realistic program before we decide how much we are willing to sacrifice. The basic assumptions that seem valid in planning our strategy within which we should plan our trade-offs, are as follows: first, modern intensive agriculture is here to stay and, as long as fuel is available, it will be mechanized. Therefore, monoculture of crops, large livestock feeding operations, and other intensive developments are a necessity if mankind is to be freed for maintaining and expanding his industrial empire and practicing the creative arts. Second, soils are to be managed principally to stimulate productivity and only secondarily as a pest control operation; but they can be modified to avoid hazardous conditions. Third, crop and livestock genetics will have to be manipulated but with the first objective of avoiding pest inducement. Fourth, every weakness in the pest's biocycle must be exploited to suppress its survival, reproduction, and multiplication. Fifth, the environment must be managed so as to suppress or destroy the primary pest or to alleviate its attack by altering ecological conditions where possible or by using properly designed chemicals when necessary.

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Crop Protection Problems in Latin America

J. Lawrence Apple and Ray F. Smith

[A recent survey of eight Latin America countries suggests that agricultural pest problems are serious and growing, while these countries have too little capability for dealing with them. Better quarantine facilities, better control and knowledge of pesticides, and a greater capacity for using biological controls in flexible combination with chemicals are needed.]

Within the past few years substantial food production gains have occurred in some developing nations as a result of the "green revolution." In this process, the system of traditional agriculture characteristic of many areas in developing nations is giving way to a more intensive shift toward modern agricultural technology. Traditional agriculture is generally considered to be a production system operating at a low energy level and approaching a state of biological equilibrium. It is labor-intensive with low capital inputs and low productivity. The fields are generally small, and sparsely planted with seeds of mixed genetic types. Such a "mixed cultural system" is not as readily exploitable by endemic plant pests as modern "monoculture" systems, and it also provides some protection against climatic adversity and attack by new pests because of its inherent heterogeneity. The tillage system of traditional agriculture is generally so poor that the plants are not as susceptible to some pests as types grown under more favorable conditions. This does not mean that traditional agriculture is lacking

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in pest problems. In reference to traditional Mexican agriculture, Harrar pointed out that pests "...have been tolerated rather than controlled, although on occasion they have exceeded any reasonable limit of tolerance." Nevertheless, modern agriculture is more vulnerable to pests. In any case, the potential for pest damage is greater in most of the developing nations under any system of agriculture than in the developed countries because the former are mainly tropical or subtropical. Pest species occur in greater numbers in the tropics, and their populations are not inhibited by the vicissitudes of climate as in the temperate zones.

As contrasted to traditional agriculture, modern agriculture is a more intensified system that integrates capital inputs with management technology to maximize production per unit of area at minimum cost per unit of production. Many of the practices developed to achieve these goals contribute to increased plant pest problems. Some of the most important are:

Monoculture: Modern agriculture is often dependent upon a monoculture system. Crop varieties are highly selected for yield and other desired traits so that genetic variability between individuals is minimized. Such varieties are then planted on vast acreages within the same general region, which provides a very favorable environment for the build-up of insects and diseases. This has led to a situation where several major crop plants of modern agriculture exist on a very narrow genetic base which enhances their vulnerability to devastation by pests. As an example, an estimated 90 percent of the U.S. corn acreage in 1970 was planted to varieties having a common source of cytoplasm. In that year an outbreak of Southern Corn Leaf Blight reduced significantly corn yields in the United States.

Plant breeding and selection: In most plant breeding programs, major emphasis is given to the selection of high-yielding varieties of crop plants. At times segregating populations are also selected for pest resistance; however, it is not possible to expose the new selections to all possible pests (or all strains of any one pest) before it is distributed as a new variety. History records many examples of new varieties that were highly susceptible to previously innocuous pests or to new strains of major pests.

Plant introduction: The development of modern agriculture has seen the exchange of genetic materials between continents to achieve desired varietal characteristics such as higher yields and resistance to pests. On the negative side, plant introductions transport pests to new areas where they may become more destructive than in their original habitat, or the newly-introduced plant types may be more susceptible to previously innocuous endemic pests than local varieties.

Vegetative propagation: Many important food crops are propagated vegetatively to preserve highly desirable characteristics. The method has the disadvantage of disseminating disease-causing organisms which are carried in plant parts.

Management practices: Many management practices of modern agriculture enhance susceptibility to disease or attack by insects such as: a) fertilization which produces larger and more succulent plants that are often more susceptible to disease or insect damage than plants grown at lower nutritional levels; b) irrigation which favors many disease and insect pests as contrasted to the fluctuating soil moisture levels under natural rainfall condition; c) tillage which has been found to be an important factor in increasing the incidence of disease as compared to no-tillage culture; d) multiple cropping which promotes rapid build-up of pest populations; and e) more dense plant populations with resulting micro-environment changes that favor the development of some pests.

The "green revolution" has introduced the above modern agricultural practices into the developing nations at a very rapid rate, and the pace of the process promises to quicken in the future. Motivated by increased production under the new technology, many developing countries and international organizations have placed great emphasis on the development and introduction of new agricultural technology applicable to the developing world. There is no other alternative—but we are concerned that these modernizing practices, which also enhance the potential for destructive pest attacks, are being introduced without giving proper attention to crop protection as a component of agricultural development programs. The fact that the changed ecology coincident with the introduction of new methodologies will result in shifts in and probably an intensification of pest problems is not properly reflected in most of the development programs with which we are familiar around the world. There is mounting evidence indicating that pest problems in the developing countries are becoming more severe as modern practices are introduced. Unless bold measures are taken to protect these crops against the ravages of pests, production gains realized could vanish and hope for the future could be lost.

In this connection, a distinction must be made between solving an important high priority pest problem in a developing nation and developing a crop protection response capability. The former has been used all too often in the past and is still advocated in some quarters today. This overlooks the fact that pest problems do not stay solved. Pest problems involve dynamic pest populations which are continually shifting. Pest problems can only be managed over time, and the process requires a continual surveillance and an action response capability.

Status of Latin American Pest Controls, 1972

Plant quarantine situation: The general increase in the ground and air transport within these countries is bringing new pressures on their already inadequate quarantine facilities. New roads are being constructed which are opening new areas to mass transport of people and materials within individual countries. This will probably result in the spread of existing pests into new areas at an accelerated rate. International travel and trade is bringing increased movement of agricultural products, with the always present danger of introducing new pests.

Most of the plant quarantine programs are ineffective because they lack personnel, legal authority, organization and facilities. Plant introduction stations are totally lacking where newly introduced plant materials can be grown under full quarantine conditions to ascertain the presence of unwanted pests before their release into the country. There are some situations in which selected growers are authorized to produce such material under quasi-quarantine conditions before release for general use. Inspections for pests at ports of entry in most countries is either inadequate or lacking. In many cases, the quarantine statutes need updating before effective programs can be developed. Plant quarantine under the best of conditions cannot be 100 percent effective in preventing the introduction of unwanted pests; however, its effectiveness has been demonstrated repeatedly in the U.S. where dangerous pests have been discovered many times on incoming shipments by quarantine officials. The Latin American countries need to strengthen this aspect of their crop protection programs.

Pesticide management: Programs for the regulation and proper use of pesticidal materials are grossly inadequate in nearly all Latin American countries. Import of pesticides is increasing in all these countries, but the import restrictions found in a few countries are based on balance of payments considerations rather than on chemical content. Most countries have pesticide registration requirements, but the registration process is either routine or one based on very little toxicological, analytical and performance data. The requirements in some countries consist of a sample being submitted by the company that is analyzed for "active ingredient." If it meets the analytical claims of the manufacturer or distributor, it is registered for distribution and sale. This results in the registration and use of many pesticide formulations in developing countries that are based on their clearance in the U.S. or other countries with quite dissimilar pests and environmental conditions.

Since pest control efficacy data generally are not required for registration, pesticide use recommendations are at the discretion of

the distributors. This situation undoubtedly results in the misuse of many pesticides, i.e., use on the wrong crops for the wrong pests and in improper amounts. This results in high-level toxic residues on food crops. The capacity for monitoring food crops for pesticide residues is limited throughout Latin America and is not adequate anywhere. This problem area has received only minimal attention, especially on food crops for domestic consumption. Pesticide residues on agricultural commodities for export are now receiving additional attention because of the restrictions imposed by international commerce, but even in this area much remains to be done.

Pesticide use is increasing everywhere, and pesticide poisoning is responsible for the sickness or death of scores of individuals annually in most Latin American countries. Most of this poisoning is due to accidents with pesticides or pesticide containers or to inadequate precautions in applying pesticides under field conditions. It is difficult to get accurate data on the extent of pesticide poisonings in these countries, but data from the World Health Organization on the numbers of hospital patients treated for pesticide poisoning in Guatemala over a four-year period demonstrates the magnitude of the problem. From 1968 to 1971, 3,869 patients were treated; 1,100 received treatment in 1971 alone. There is no way to estimate the number of unreported and undiagnosed accidential pesticide poisonings which result in serious illness or death. Most poison cases occur among workers directly involved with the application of pesticides. This results from the use of improper application equipment, failure to use proper protective clothing, or from mishandling of toxic materials in mixing and filling application equipment. Another common mechanism for poisoning is from the pesticide container. It is frequently sold in the local markets or brought home from the fields by the worker for use as a mixing or storage container for food or water.

Lack of biological control capability: As a principal method of managing insect populations, biological control is not receiving adequate attention in Latin America. This stems from the fact that there are very few in these countries formally trained in biological control. Some areas have already experienced pesticide resistance and pest population resurgence problems because of the overdependence on chemical control which has eliminated natural predators and parasites. The experiences with cotton in both Peru and Nicaragua are good examples. Resistance was built up in the pest populations to the point of ineffective chemical control even with more than 30 applications each growing season. With this high cost of achieving what amounted to poor pest control, cotton production became economically unfeasible. In several coastal valleys of Peru a tremendous reversal was achieved by the application of ecological and biological control principles. A similar trend is evident in Nicaragua.

Although the use of pesticides is increasing, the usage level has not reached that of the developed countries. Consequently, there remains much natural biological control in Latin America that should be utilized to develop and maintain economically and ecologically sound pest management programs. The cotton situation in both Peru and Nicaragua (as well as other countries) signals the hazard of ignoring biological control and demonstrates the benefits derived from its promotion. This aspect of pest management should be strengthened in Latin America.

Importance of pests now and in the future: It has been difficult to collect accurate data on crop losses due to pests anywhere in the world, and this is especially true in the developing nations. There is a propensity for more severe pest problems in the tropical and subtropical zones than in the temperate zones. Since much of Latin America lies within the former zones, crop plants are assailed by an array of insect, disease and weed pests. Based on what many specialists consider to be conservative estimates, annual agricultural production in the world is reduced by 25 percent due to pests. It definitely is much higher in the tropical zone than in the temperate zone by a factor of at least two. Recently compiled statistics for Peru illustrate the high loss of potential crop production attributable to pests. The value of crop production in Peru during 1970 was estimated at $487 million. It was estimated by the Sub-Direccion de Defensa Fitosanitaria of the Peruvian Ministry of Agriculture that production was reduced by 38.2 percent of its potential by pests or by a value of $187 million, assuming stable market prices. These losses by type of pest are as follows:

Type of Pest	Crop Loss (percent)	Crop Loss (U.S. $-Millions)
Diseases	10.8	53.0
Insects	15.8	77.3
Nematodes	6.0	29.3
Weeds	5.6	27.4
TOTALS	38.2	187.0

Crop loss estimates due to pests would probably be similar for other Latin American countries. Some may consider these estimates excessively high, but experimental data supports loss estimates of this magnitude and even higher for pests, especially weeds.

These problems are especially serious for food deficit countries. And the current magnitude of loss occurs under production conditions which utilize predominately "traditional" rather than "modern" production technology. Given the present crop protection capabilities of most Latin American countries, crop production losses due

to pests will increase as modern production technology is utilized more widely. Potentially, the stage could be set for outbreaks of disease that affect wide geographic areas, and damaging insect pest attacks, unless measures are taken to strengthen crop protection programs. In our trip to eight Latin American countries in early 1972 we found evidence of intensified pest problems in conjunction with the introduction of new agronomic practices, including new crop varieties; examples are corn in Brazil and wheat in Bolivia. Some old pest problems have moved from minor or a reasonably well controlled status to serious, e.g., pinworm of tomato in the Cauca Valley of Colombia, witches broom and Monilia fruit rot of cacao in Ecuador, Colombia and other areas. Pests have also breached international boundaries. Coffee rust in Brazil now threatens all other coffee-producing areas in Latin America. Indications of insect resistance to pesticides were found on cotton in Santa Cruz, Bolivia, and on tomatoes in Colombia.

Present crop protection programs: The crop protection program capabilities vary widely among the countries of Latin America. Although great improvements have been made in most countries over the past 20 years, additional progress and broader approaches are needed. In some countries there is evidence of deteriorating response capability in view of present pest problems and new country goals. There are well-trained crop protection specialists in some countries but in all cases their numbers are inadequate to the task. Almost without exception the well-trained individuals are "underemployed;" i.e., critical elements of a vital, problem-oriented program are lacking so that they are not performing at full potential as measured by program accomplishment. In most cases, the time of crop protection specialists is divided between too many problem areas. General program support is inadequate. The result is a "holding-action-type" program absorbed by yesterday's problems and without sensitivity to contemporary problems or to opportunities for developing long-term pest management strategies. This is the situation because of the diversity and multiplicity of the crops and their pests in the tropics and too few people and resources to work on them.

Crop protection as a general problem area has received inadequate attention throughout Latin America. Most of the agricultural production programs have emphasized land and crop management factors without due consideration of production limitations imposed by pests. Our discussions with research program officials in Latin America revealed an increasing awareness of the current production losses under conditions of intensive culture. Most administrators expressed the desire to improve their research and education (extension) programs in the pest management area.

Important problems that should yield to solution: There are many important pest problems in Latin America for which solutions are highly feasible. The institutions and ministries in many countries are developing systems for priority ordering so that existing resources may be concentrated on the high priority problems. Many of the decisions which must be made to effect impact programs are within the administrative prerogatives of present program directors and would not require significant new resources. Short-term consultants could assist with the priority ordering of problems and the organization of impact programs, including the research and demonstrational (extension) approaches that should be most productive.

[Excerpted from "A Preliminary Study of Crop Protection Problems in Selected Latin American Countries," 1972, a study undertaken for the U.S. Agency for International Development.]

Integrated Systems of Pest Management

Subcommittee on Insect Pests,
Agricultural Board of the U.S.
National Academy of Sciences

[Successful pest management requires an integrated use of biological and chemical control methods based on understanding of the ecosystems in which pests coexist and interact with vegetation, insects, animals, and pest predators. Reliance on pesticides alone has proved to be costly, hazardous, and in the end ineffectual; but pesticides continue to be needed along with other methods provided ecological principles are observed.]

The experience of the past two decades suggests that there is no simple one-step solution to the problem of insect and pest control. An attitude of unreserved optimism became prevalent among most entomologists after World War II with demonstration of the spectacular effectiveness of DDT. But failures of synthetic organic insecticides to control all pests, or keep control of those that were first reduced, and a variety of adverse consequences of their widespread use have changed this attitude to a more rational, somewhat pessimistic one. On the other hand, attempts to control pests by bioloigcal means have resulted in striking successes in some cases. Importation and dissemination of exotic parasitic and predacious insects, development and use of insect-resistant plant varieties, and dissemination of insect pathogens have given excellent control of a few species. [For a brief review of some recent research in biological control methods, see Development Digest of October 1970, pp. 50-62.] However, the problems posed by such genetically plastic and evolutionarily resourceful organisms as insects, and their interactions with a rapid changing agriculture, are too dynamic to be solved by reliance on one-component control systems. Man's efforts to control arthropod pests, for example, have sometimes resulted in as much harm

as good. During the last few decades, substantial information has accumulated to suggest that pest control must be extended beyond ad hoc empirical methods to a system based on principles of applied ecology. Such a system has been developing rapidly; it has come to be known as integrated control.

Several definitions of integrated control have been proposed. They include:

1. Applied pest control that combines and integrates biological and chemical measures into a single unified pest-control program. Chemical control is used only where and when necessary, and in a manner that is least disruptive to beneficial regulating factors of the environment. It may make use of naturally occurring insect parasites, predators, and pathogens, as well as those biotic agents artificially increased or introduced.

2. An ecological approach to pest management in which all available necessary techniques are consolidated into a unified program, so that populations can be managed in such a manner that economic damage is avoided and adverse side effects are minimized.

3. A program of population management designed to keep pest populations below economic tolerance levels by maximizing environmental resistance and supplementing this by use of selective pesticide applications if economic tolerance levels are threatened.

4. Utilization of all suitable techniques to reduce and maintain pest populations at levels below those causing injury of economic importance to agriculture and forestry, or bringing together two or more methods of control into a harmonized system designed to maintain pests at levels below those at which they cause harm—a system that must rest on firm ecological principles and approaches.

All the proposed definitions have one common theme: the system must be based on sound ecological principles. Early definitions emphasized a two-component system based on biological and chemical control, and the concept of integrated control has come to be most frequently thought of as a blending of these two control techniques.

Need for Integrated Systems of Pest Management

The rapid development of integrated-control techniques and their widespread acceptance during the last two decades have resulted from a growing awareness of the shortcomings of single-factor approaches to pest control. Sole reliance on chemicals for pest control has the following drawbacks: 1) selection of resistance to insecticides in pest populations; 2) resurgence of treated populations;

3) outbreaks of secondary pests; 4) residues, hazards, and legal complications; 5) destruction of beneficial species, including parasites, predators, and pollinating insects; and 6) expense of pesticides, involving recurrent costs for equipment, labor, and material.

Resistance is a problem in evolution; some individuals in almost every population of pests possess more ability than others to detoxify a chemical and render it harmless, or to escape its effects through changes in behavior. High levels of resistance to one or more insecticides occur in some isolated populations of normally susceptible species prior to their exposure to the chemicals. Resistance has been observed in about 220 major pests, including species of mites, mosquitoes, house flies, moths, and beetles. With some species the problem has already accelerated to a frantic race by entomologists to develop new pesticides in order to keep just one step ahead of the pests.

Resurgence is a phenomenon with roots in basic ecological principles. The ability of an organism to reproduce and increase is usually variable; in addition to the organism's genetic composition, one of the major factors influencing this ability is its own density. As density increases, competition for food and other requisites increases and reproduction decreases. If the population rises to extreme heights, reproduction may cease and the population may decline precipitously. At low densities, there is little competition, and reproduction is at or near its maximum for the existing environmental conditions. Thus, a pesticide applied to a high pest population may drive it to a low level where reproduction is great, with the result that the population surges back to its original high and damaging proportions. Pesticide destruction of beneficial parasites and predators that normally hold pest populations in check is often an important factor in resurgence. If, in addition to having a higher reproductive capacity at low densities, a pest is simultaneously freed from its natural enemies, its resurgence will be that much more rapid.

The outbreak of pests other than those against which pesticides are directed is a common phenomenon. For example, the red-banded leaf roller increased in importance on apple trees in Ontario, Canada, from 1929 to 1956, from an insect of casual or even rare occurrence to one of the most serious with which fruit growers had to contend. It rose to a position of primary importance as a consequence of a pesticide program directed against other species. The mechanisms involved in this phenomenon are not certain. It seems clear, however, that a factor of major importance was the destruction of parasites and predators by use of wide-spectrum pesticides.

Hazards to man of the widespread use of chemical pesticides have not been adequately evaluated because of insufficient informa-

ion; there is no evidence so far that the minute traces of pesticides with which man is in daily contact injure or seriously affect him. However, this is not the case with many species of wildlife, especially fish. There is ample evidence that substantial populations of various wildlife species in many areas have been destroyed or seriously harmed by contact with pesticides. The hazards from misuse of the more toxic chemicals are quite clear.

Cost is one of the most important drawbacks to excessive reliance on chemicals for pest management. Hundreds of millions of dollars are spent on pesticides each year in the United States alone, but statistics are poor on the value of the crop saved by the use of chemicals. One of the most pertinent facts about the comparatively high cost of pesticide programs is that substantial reductions can be made in the amount of chemicals being used for pest control without sacrificing efficiency. This can be done by 1) replacement of scheduled applications with applications based on population assessment, and 2) recognition that many crops can tolerate substantial levels of infestation of some pests without economic loss. The general public, perhaps unfortunately, has been conditioned to demand food products totally devoid of blemishes produced by pests. Growers have been led to expect absence of all pests, which frequently is not required to prevent economic loss. The demand for such unnecessarily high efficiency in pest control has been further conditioned by the action of regulatory agencies in declaring that insects in food are filth or indicators of filth. These attitudes lead growers to apply ever-increasing amounts of pesticide, and they seriously handicap efforts to adopt other pest-management systems that do not require excessive application of pesticides. As the advantages of such systems become better known, consumers may alter their attitudes and accept an occasional blemish.

These points illustrate the weakness of pesticides as strategic tools for pest control. To broaden this indictment: no single artificial control technique should be relied on exclusively for the regulation of pest populations. Most one-component systems lack the flexibility necessary for the suppression of dynamic pest populations; almost invariably, one-component systems lack permanence. Moreover, many one-component systems create unwanted side effects, because they do not adequately recognize other components of the ecosystem and they tend to disrupt rather than to harmonize with them in advantageous ways. Finally, most pest situations involve complexes of pest species, and this adds dimensions and demands normally beyond the scope of any one-component control system. However, no individual control technique—and most emphatically this includes pesticides—should be rejected from consideration in integrated control systems. Each control technique has a potential role to play in concert with the others. Chemical pesticides will

continue to be one of the most dependable weapons of the entomologist for the foreseeable future. Rapid expansion of agriculture, in the developing countries especially, will demand repressive applications of chemicals for pest control until more acceptable techniques can be developed.

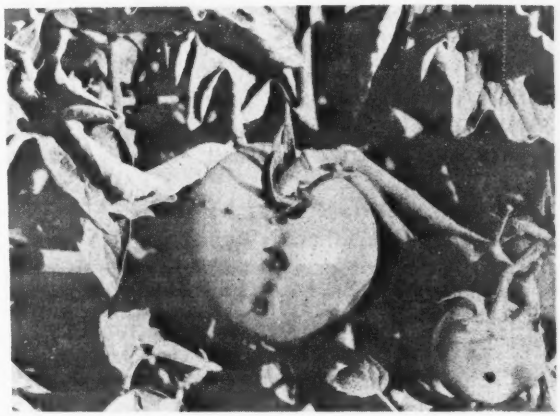
Basic Principles of the Integrated-Control Concept

Consideration of the ecosystem. The first principle of pest control, around which all other principles revolve, is consideration of the ecosystem. The ecosystem is here considered to be a unit composed of the total complex of organisms, including the pest species, their competitors, other associates, and their food, shelter, hosts, and culture; weeds and other plants; soil and water and their management; the overall conditioning environment; and the various agricultural, industrial, and recreational activities of man. Control of populations is a function of the ecosystem, and knowledge of the role of all the principal elements of the unit is essential to an understanding of population phenomena. The most effective system for controlling pests can be devised only after thorough knowledge has been gained of the principles underlying the fluctuations of populations that make up the ecosystem. The limits of an ecosystem, i.e., the area encompassed, must be large enough that the important biological components are included. For example, an agricultural ecosystem will usually include a group of fields, their margins, and certain other types of surrounding areas, such as woods, streams, and weedy, uncultivated areas. It should be considered as a part of a larger ecosystem in cases where pests may move easily into and out of the smaller area.

Size, density, and variety of host plants in the ecosystem affect pest density. These are important factors in pest-management concepts, because they can be managed or manipulated to advantage in regulating pest-population density. Although ecosystems are complex, there is no need to be overwhelmed by the difficulty of acquiring all the data necessary for developing the most sophisticated integrated-control techniques. Much progress can be made by using simple pest-management programs based on limited understanding of components of the ecosystem. Appropriate and successful beginnings can be made by regarding the ecosystem as a complex of overlapping subsystems, each of which, from the standpoint of pest control, can be analyzed separately, with attention concentrated on the key pest species.

In any agricultural or forestry ecosystem there are seldom more than a few "key" pests, and often there is only one. Serious, perennially occurring, persistent pests, that dominate control practices because their populations often remain above economic thresholds

and thus require continuing applications of pesticides, may be defined as key pests. The kind of damage they cause, or their abundance, determines the status of key pests. Low numbers of some pests can cause high damage, for example vectors of plant and animal pathogens, and those, such as ticks, that secrete toxins producing paralysis. Also, key pests often attack the harvested unit of crops. With these, it may be necessary to begin control procedures at relatively low population levels. For example, tomatoes attacked by the tomato fruitworm, such as those pictured here [Photo: U. S. Department of Agriculture], may suffer little loss in yield. However, the presence of a single entry site destroys the marketability of the fruit. When the same pest attacks grain sorghum, it primarily reduces the quantity of grain harvested and affects grain quality very little. Thus, considerably higher levels of infestation by this pest can be tolerated in grain sorghum than in tomatoes. In general, pests that transmit pathogens, and those that attack the harvested unit of crops, impose unusually stringent requirements on a control program in that such populations must be suppressed and maintained at unusually low levels.



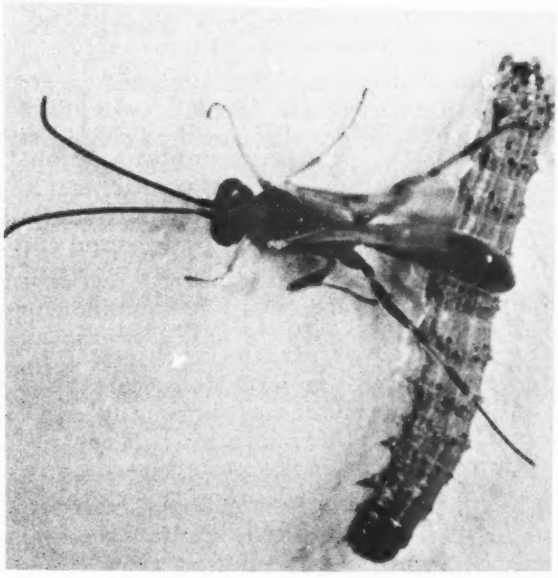
"Occasional" pests, in contrast to key pests, vary in importance: they create problems only in certain areas, or during certain years. Such pests are usually under adequate biological or environmental control; however, disruptions or weaknesses in control occasionally occur, and these permit the pest to increase to economic levels. These occasional pests are especially suited to integrated pest-management techniques, and it is against such pests that a system of corrective as opposed to protective treatment has its greatest impact. Also, insect-resistant crop varieties or strains have great utility for control of pests of this category. It is with these pests that means of predicting the occasional occurrence of damaging populations assume special importance. Accurate predictions of their occurrence in numbers above economic levels make possible the application of control measures in a manner that will bring the regulatory factors back into dominance in the shortest possible time.

"Potential" pests cause no significant damage under current conditions. In attempts to control key and occasional pests, care must

be taken not to alter conditions through injudicious use of chemicals or through cultural practices to an extent that would permit potential pests to realize their potential and become occasional or key pests.

Utilization of indigenous natural control agents. Relative scarcity rather than great abundance is characteristic of most insect species; but often a few species will develop very high populations over some portions, but not all, of their range. Such species are then exposed to important population-regulating factors including natural enemies within the ecosystem. Data are rapidly accumulating to support two points: biological control agents usually make up a major portion of environmental resistance to increases in insect numbers; and insects and related arthropods acquire a new pest status most often as direct or indirect consequences of man's activities. Thus, it is important that full use be made of indigenous natural control agents.

One of the most widely known and successful examples of this approach to pest control is that with orchard pests in Nova Scotia, Canada. Control consisted chiefly in obtaining maximum benefit from natural control agents already established in the ecosystem; introduction of new species was avoided. A supplementary measure was to apply pesticides, but this was resorted to only when economic tolerance levels were threatened. Similar but somewhat less sophisticated systems for control of cotton insect and spider mite pest complexes have been operating successfully for decades in Arkansas and Louisiana in the southern United States, and in California in the western United States.



Biological pest control in action—a parasitic wasp lays eggs in insect larva. Eggs will hatch and destroy larva. [Photo: U.S. Department of Agriculture]

Maintenance of ecosystem complexity. It is an accepted principle of ecology that complexity tends to exert stabilizing influences and simplicity tends to exert disruptive influences in the ecosystem. The tendency of populations of pests of crops grown in monocultures to oscillate widely in "boom-and-bust" cycles is well known and is in strong contrast to the characteristically more stable populations of pests associated with polycultures or natural communities. It would be highly desirable to work toward the development of complex polycultures as opposed to monocultures, from the standpoint of pest control. The interplanting of various species and varieties of crops in a complex polyculture may result in yields equal to or even greater than that produced in monocultures. However, it remains to be seen whether systems can be devised that are of satisfactory efficiency for planting, cultivating, and harvesting such complex mixtures of crops. Here, too, the principle of economic thresholds must be observed: much of man's economic advances stem from his success in simplifying agricultural ecosystems.

Avoidance of disruptive actions. Since populations of insects and related arthropods most often increase to injurious levels as a result of man's activities, it is important that disruptive actions be identified and either avoided or minimized, when possible. Making use of the selective action of pesticides on predator-parasite-pest complexes is one way this may be achieved. Differential mortality may be obtained under field conditions by paying attention to methods of pesticide application, formulation, and dosage rates; timing; area of treatment; residual activity of the pesticides; habits of organisms involved; and innate physiological selectivity.

Application of minimum selective hazards. The principle of "minimum selective hazard" may be defined as the application of chemical control measures to pest populations in such a manner that target populations are kept just below economic-injury thresholds. By observation of this principle, the selection of resistant populations is avoided or delayed, the possibility of resurgence of treated populations is decreased, adverse effects on non-target organisms and the amount of environmental contamination are reduced, and the cost of control is lowered. The application of pesticides to restricted areas affords an opportunity for observing the minimum-selective-hazard principle. One of the most intriguing examples of this principle is described for the horn fly. The sexes of this pest have different resting sites on cattle. Males use the area around the ankles almost exclusively. By treating this area only, the proportion of males to females, and consequently the number of females inseminated, is drastically reduced, and control of the pest is obtained.

Exclusion from new areas. Most species occupy only a small portion of the territory suited to them, and, except for specific physical

barriers, there is usually no obvious topographical-climatic restriction of their area of distribution. Much more attention should be directed at efforts to exclude pests from those areas that make up the vast territory suited to them but in which they do not presently occur. Basic strategy in human warfare is to prevent the enemy from occupying previously unoccupied areas and to deny him access to certain other requisites, for example, food. This is also prime strategy in pest control.

Interest only in pests that have so far appeared in one's own country is an indefensible position for biologists to take, anywhere in the world, in view of shrinking distances and increasing contacts between various countries, which have come about with improvements in transportation. Methods on a global basis for preventing pests from extending their present distribution, developed from sound ecological bases, should have highest priority as being the most desirable and economical of all pest-management systems. Otherwise, man faces the certain consequence of comparatively rapid spread of many important pests to the limits of their ecological adaptability. The sort of international cooperation that has developed for control of stem rusts of wheat and other cereal grains provides a model for what could be done to prevent spread of arthropod pests. Approximately 150 scientists at 85 locations in 40 countries are involved in this program.

Crop adaptability to ecosystems. Time and place of crop production are commonly accepted as being determined by the suitability of climate, soils, and seasons. Consideration should also be given to the feasibility of producing a crop profitably in the face of virtually certain damaging attack by insects. It is just as important to conduct pest surveys as it is to conduct soil surveys and make studies of water availability and the climate of an area before deciding whether to grow a crop in such an environment. This may be of very great importance in less developed nations as programs aimed at expanding and intensifying agriculture are initiated and carried out. Realistic pest management demands the application of this principle.

For example, the recent large increase in acreage of soybeans grown in the United States as a result of increased demands for oil and protein raises the question of adaptability of this crop to certain areas because of pest problems. In much of the northern two thirds of the United States, where soybeans have traditionally been produced, the crop is virtually free of attack by important insect pests. However, in many of the states bordering the Gulf of Mexico, growers are faced with the prospect of attempting to produce a crop profitably in the face of certain attack by a complex of more than 25 species. None of these insects is currently a key pest, but at least 10 of them are capable of assuming this status. There are imposing numbers of

predators, parasites, and pathogens present. In addition, soybeans, like cotton, can tolerate appreciable amounts of apparent injury to foliage without effect on yield or quality of seed. These elements provide the bases for development of an effective pest-management program. By taking maximum advantage of indigenous predators, parasites, and pathogens, and the capacity of the crop for tolerating considerable amounts of apparent injury without loss of yield or quality, use of selective insecticides can be restricted to applications required to control populations of pests that reach economic-injury thresholds. Meanwhile, research can be done to increase resistance, especially the tolerance component in soybean varieties, to as many pest species as possible, for example. Thus, it may be possible to produce the crop economically in such areas until more sophisticated pest-management systems can be developed. Otherwise, growers will be forced to abandon efforts to grow soybeans in many areas bordering the Gulf of Mexico, because the economics of production are such that an extensive chemical-control program cannot be sustained.

Utilization of economic thresholds. A basic element in pest-management systems is the principle of economic thresholds. In this connection the term "pest" requires definition: a pest is a living organism that occurs in numbers inconvenient to man. The term is without strict biological validity, because it relates only to human values of health, economics, comfort, and esthetics. Pest status is attained only when population densities that may cause significant reductions in yield or quality of crops and livestock are reached or when man's health or comfort is threatened. An economic threshold in this context is usually defined as the level at which damage can no longer be tolerated and, therefore, the level at or before which it is desirable to initiate deliberate control activities. This definition probably should be amended to consider a more critical threshold density as that where the loss caused by a pest just equals in value the cost of available control measures. It should also take into account any known adverse side effects, which may have ecological consequences that cost more in values lost than is gained by control of the pest in question. The determination of these thresholds is prerequisite to the development of any system of pest management for two main reasons: first, the level of pest populations below which damage is tolerable must be known, thus defining the ultimate objective of the control system; second, the level must be known above which new emergency elements of the integrated program must be applied or invoked to avert significant injury and an outbreak of the pest organism.

To obtain this information, a clear picture of the complex economic factors associated with the production of the crop of interest is vital. First, the general economic picture must be known, and

the margin of profit on which the agriculturalist or forester is operating must be determined so that the amount he can afford to lose to the depredations of pests can be assessed. Second, the cost which can be afforded for protection against this level of loss must be established. For example, if a grower can afford to lose X dollars per acre to pests and still show a reasonable profit, he can afford up to but not more than X dollars for protection of his crop by use of the control methods available to him. If his crop can be protected for less than this amount, the difference will be added to his profit. It is difficult to determine economic thresholds and levels of tolerance because of the great number of factors involved and because many of the factors are economic and not readily available to or assessable by animal and plant scientists. It is axiomatic that the threshold levels will change constantly with changing economic and environmental conditions. There have been few analyses of the economics of crop production relative to pest problems, and principles have rarely been developed or limits clearly defined. Consequently, it is not unusual for more to be spent to control a pest than the value of the commodity the pest could destroy, or, even worse, for helpful insects to be destroyed at considerable cost.

On the basis of the available fragmentary evidence, it may be concluded that economic threshold levels are almost invariably higher than expected. Too frequently, the visual threshold, i.e., the population level at which individuals of the pest species are obvious, is synonymous with the action threshold, and both are equated with the economic threshold. The action threshold should be the level of pest population at which action must be taken to prevent the population from rising to the economic threshold where significant damage occurs. Ideally, it would be desirable to have control systems that are so effective and self-perpetuating that the necessity for emergency action is avoided. Most systems, however, will probably require periodic action; thus the determination of the action and economic thresholds becomes of supreme importance. The level of economic injury is difficult to determine. This is often assumed to be the level at which significant numbers of pests destroy important quantities of product, but in practice it is a subjective determination. Damage that causes nutritive loss or adversely affects the usability or palatability of the product is far more important than damage that merely affects appearance. Esthetic values may easily be overemphasized in this regard, and modern marketing and sales promotion tend to encourage this error.

Prediction of population trends. Once the economic status of the pests occurring in any ecosystem has been determined, studies on the biology and ecology of the pests must be developed. These have two purposes: prediction and manipulation. The main value of being able to predict future trends in the population levels of pests is that

it enables the intelligent application of control measures to prevent rises above the economic-injury level. Most pest-management programs will be complex interwoven systems with a number of major components. Pest populations will certainly not be eliminated in these programs but, rather, will fluctuate at low levels generally acceptable to man. From time to time these fluctuations will approach the economic-injury level. If reaction to such fluctuation is in the application of vigorous extra measures, the system may be permanently disrupted. Therefore, means for predicting future population trends with accuracy and confidence must be developed, so that new components may be added to the system only when required to damp potential outbreaks; components must be selected that have a minimal disruptive influence on the system as a whole. When danger is past, these components should be dropped from the system until they are again required.

Maintenance of subeconomic populations. Full development of integrated-control systems requires the continued existence of pest populations in the ecosystem. This is the most difficult aspect of the integrated-control concept for many to grasp. Low pest densities may need to be conserved to maintain the pest-management system and to provide the necessary elements of permanence and dynamism. If the pest is completely eliminated, many of the regulating components of the ecosystem may also disappear. Pest-management systems often cannot operate without the presence of pests in subeconomic populations. In the absence of these critical components, the pest-management system can no longer function as a self-generating system if the pest reinvades the ecosystem, as it is almost certain to do. The subeconomic pest population and its associated natural controls need not always be in the crop-growing area. With highly agile populations they often are not, but may be in nearby uncultivated areas, hedgerows, weeds, and cover crops.

Successful Unilateral Pest-Management Systems

Systems of pest management based on the single-factor approach are proving to be less and less reliable. Nevertheless, there are examples in many unilateral systems that have worked successfully for decades and show no evidence of declining in effectiveness. All such examples show evidence of having been developed from intimate knowledge of biological and ecological principles. These approaches have been based on manipulation of ecological niches, with the objective of disrupting the ecological requirements of pests, or of augmenting ecological intolerances. Biological requirements such as food, breeding sites, and shelter are vulnerable requisites for pest species. Denying access to one or more of these is an enlightened ecological approach that has been demonstrated to be effective.

Satisfactory control of the southern cattle tick on cattle in Queensland, Australia has been obtained by denying the pests access to their hosts for periods long enough to break the life cycle. This technique of pasture "spelling" was based on data showing that ticks detaching from their hosts during mid-April to mid-July produced few or no progeny. The reasoning that formed the basis for the approach was that if cattle were moved to an unifested or sufficiently lightly infested pasture in May and kept there until larvae in the alternate pasture died, the life cycle would be broken, and that moving cattle at four-month intervals thereafter would prevent any small residual infestations from increasing to troublesome levels. Similarly, control of a pest complex has been obtained in Egypt simply by changing the planting date of maize. Prior to development of this method, maize was planted throughout April to September, and the stem borer complex caused such severe damage to the crop that growers had to resort to extensive application of insecticides for control. By confining the planting dates to mid-May through mid-June, excellent control of all species has been obtained, and yields have increased substantially.

From Chemical to Integrated-Control Programs

It is too often assumed that once a unilateral pest-control program based on multiple applications of broad-spectrum insecticides has been adopted it is impossible to revert to an integrated-control program. It may be true that when such a program fails, and a multifaceted pest-management system has to be substituted, there is likely to be a difficult period of transition. During this time the grower may have to be willing to sustain a considerable amount of damage until corrective measures have operated long enough to allow the necessary factors to become effective in the ecosystem. However, such transitions can be made successfully.

In Peru, cotton growers of the Cañete Valley were forced to abandon the single-component system of complete reliance on application of broad-spectrum insecticides because of the development of insect resistance to insecticides, resurgence of treated populations, and elevation to pest status of several species of no previous importance. Prior to 1939 only six species were considered to be pests, and they were controlled by the use of arsenical and nicotine insecticides and hand picking of insects and infested fruit. These methods allowed a high degree of natural control to be exerted by indigenous predators and parasites. But by the 1949/50 crop year, virtually complete reliance had been placed on the applications of large amounts of broad-spectrum insectidies, such as DDT, benzene hexachloride, and toxaphene, or mixtures of these with sulfur. The most important pests were the tobacco budworm and the cotton aphid. Results of the new program were good during the first five years. Good control of the pests was obtained with consequent increases in yields. However, after the third year it was observed that the insecticides were losing

their former effectiveness. New insecticides, such as aldrin, dieldrin, and endrin, and various mixtures of these, were used, and intervals between applications were reduced. This increased costs and failed to improve the situation in many cases, and growers changed to the use of organophosphorus insecticides, such as parathion and mixtures of ethyl and methyl parathion. After these insecticides were used for a few years, six new and important pests appeared. The situation deteriorated rapidly as several of the pests developed levels of insecticide resistance bordering on immunity, and it culminated in 1956 with the worst crop in the history of cotton production in the Cañete Valley. Nearly 50 percent of the crop was lost after an average of 12 applications of insecticides failed to give adequate control of the pest complex.

Based on experience to this point, both growers and experiment station personnel concluded that it was not possible to continue profitable cotton production based on chemical pest-control programs, and in 1957 a pest-management system was adopted that contained elements of chemical, cultural, biological, and regulatory methods. The system was based on the following key points: 1) reduction in the planting of ratoon cotton (crop produced from plants cut back and allowed to produce new growth from the crown) to less than 25 percent of the total area; 2) preparation of soil without irrigation to obtain increased destruction of Heliothis virescens pupae; 3) repopulation of predators and parasites by introduction from other valleys or foreign countries, or by artificial rearing for release; 4) establishment of mandatory planting and crop-residue destruction dates; 5) adoption of recommended irrigation schedules; 6) adherence to the various cultural methods considered to be sound agronomic practice for production of uniformly early crops; and 7) limiting insecticides used to arsenical and botanical materials only, except under very special circumstances, which allowed application of systemic insecticides at dosage rates one fourth to one half of that recommended by the manufacturer to control Aphis gossypii. Seven years after the initiation of this program, the insect problems have apparently been solved and the natural balance between detrimental and useful insects has been restored. More than 30 species of predators and parasites are currently playing an important role in control of the pest complex. Finally, yields have increased by about one third compared with 1950-55 when control was based on the exclusive use of insecticides.

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Rodent Control Strategy

David E. Davis

[Research on rodent control indicates that poisoning or trapping rats rarely does more than temporarily reduce populations which soon return to their equilibrium numbers in a given environment. Changing the habitat of rodents to reduce their food and shelter is the only reliable way to keep populations down.]

The control of rodents has been a major problem for centuries and despite decades of research remains an insurmountable task. The present discussion will summarize briefly the results of research for the past three decades and suggest a strategy for the control of urban rats and other rodents. Many rodents and other mammals produce damage in cities and in agricultural areas. It is impossible to discuss all these species but it is hoped that the strategy for one species can be adapted to another.

The central theme of this presentation is that we now have sufficient knowledge of the principles of populations; hence we should design our control measures according to these principles. The major concepts here are included under the phrase population dynamics, which is the study of birth rates, mortality rates, and movement rates. From these data one can measure the changes in the population and also note that the population will be regulated at some equilibrium number that is a reflection of the environmental circumstances. Another principle that can be used is the concept of diversity, which suggests that populations are more stable if there is greater diversity in the numbers of species and in the types of environment. Given these and other subsidiary principles, it would seem that

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the appropriate strategy for control is to devise methods of manipulating the environment in accordance with the change desired in the population. Unfortunately, our political mechanisms often are unable to administer the control procedures that are dictated by the principles. A corollary of the strategy of working with principles is that research should not continue in clear violation of population principles in expectation that a politically acceptable solution will be found. Let us consider an analogy: the engineer recognizes the law of gravity, designs a bridge in accordance with it, and then indicates the costs and how the bridge must be constructed. He does not conduct research in a futile attempt to build a bridge that violates the law of gravity.

Principles of Rodent Control

Research on rat control had been carried out in a desultory manner for decades, but in the latter part of World War II a concentrated program was developed by the Public Health Service in Texas and by The Johns Hopkins University School of Public Health in Baltimore. The history of the research in Baltimore can be summarized rather briefly. Beginning in 1943, Dr. John T. Emlen developed the census method that permitted rapid estimates of numbers of rats in city blocks. The advantage of this procedure was that many discrete populations could be followed and the results of experimental treatments evaluated. The various treatments included the assessment of the value of poisons and the comparison of sanitation, slum rehabilitation, and slum clearance. Results of these extensive and detailed studies showed that rat populations will increase to the capacity of the environment and then remain at essentially the same level for an indefinite period of time, unless the habitat is changed. Additional studies including laboratory work on rats and mice showed that this level was maintained by the negative feedback mechanism, i.e., the pituitary-adrenal mechanism that reduces the birth rate and increases the mortality rate as the population grows in numbers. It was thus apparent that the reduction of rats by predation (poisoning or trapping) had only a temporary effect since the populations returned to their environmental capacity in a short period of time.

Data presented here were chosen from research done three decades ago; these principles have had an opportunity to be tested and verified in various ways. One of the basic points to consider is the population change over a period of time after reduction in numbers by predation using traps or poisons. The history of rat populations in six different blocks for approximately two years (Figure 1) shows that, after poisoning, the population promptly returns to approximately the original level and that it then remains at that level for many months. If the predation by poison, traps, and gas is intensive, then (Figure 2) the population can be kept at a low level while this is

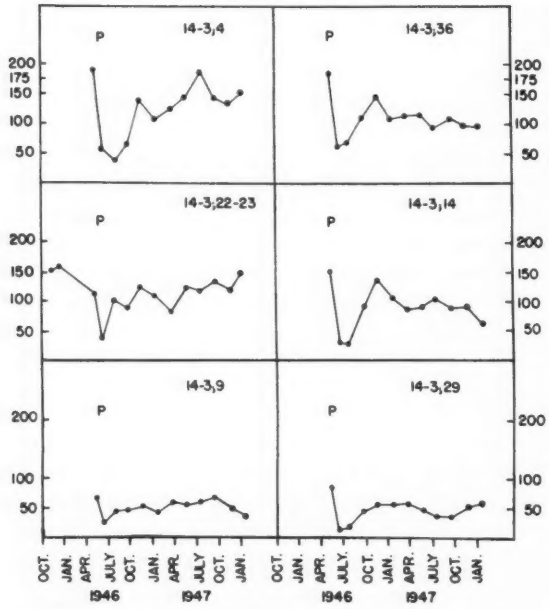

FIGURE 1 Number of rats in six blocks following reduction by poisons. [Note that the numbers returned to approximately the original level and remained there.] (The precision of estimate is about 20 percent.)

continued but will subsequently return to its capacity promptly, even after later treatments with poison. In this history, the capacity of the block remained essentially the same for four years. More detailed studies have indicated a general relationship: when the population was reduced 50 to 70 percent, the recovery was rapid; when the reduction was almost 90 percent, the return was slow but, nevertheless, it occurred. Predation by traps or poisons merely makes space for more rats to grow. Predation could be effective, as is true of any species, but for rats it rarely works. The history of rats in another block (Figure 3), which was completely freed from rats and remained free for 2.5 years, showed that once the rats returned the population increased in six months from zero to about 150. A spontaneous decrease occurred followed by an oscillating increase (up through 1949).

An alternative approach is to manage the habitat; in the case of rats, the procedure is to reduce the food and shelter. The removal of garbage and fences was done in the later years in Figure 3, which shows that this procedure reduces the population and little

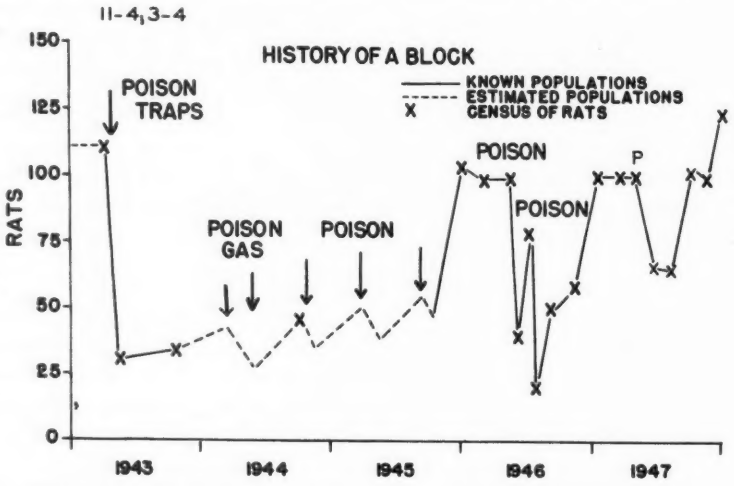

FIGURE 2 History of rat population for 4 years. The capacity remained at approximately 100. The estimates (X) were made at intervals of 2 months.

recovery occurs. A more comprehensive approach is to rehabilitate the housing in a neighborhood of several blocks, and have inspections by various city officials and enforcement of the sanitation and housing codes on both the tenants and landlords. The history of two blocks (Figure 4) that were rehabilitated, while a reference block was not, shows the drastic reduction and maintenance of a low population of rats. (At the end of the experiment the rat population in the reference block declined because the people noted the benefits of rehabilitation in the nearby blocks and spontaneously cleaned up their housing conditions.) A more drastic procedure would be the clearance of slums and the complete rebuilding of structures that will reduce the rat populations over a wide area.

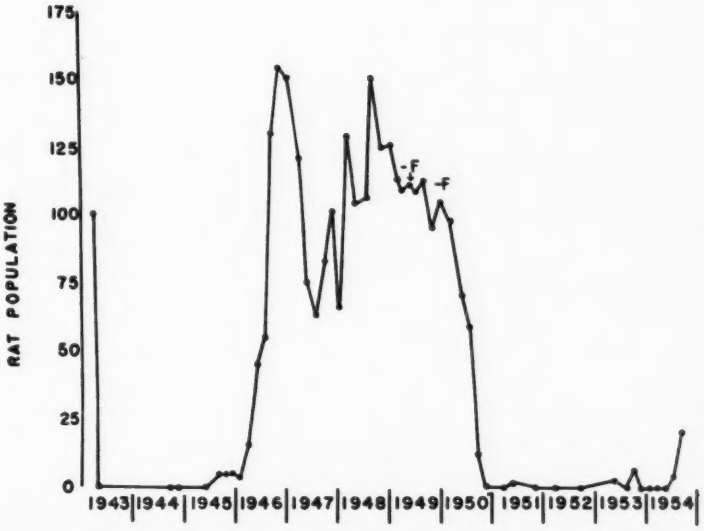

FIGURE 3 In a block where rats were exterminated, no invasion occurred for 2.5 years. Then a few rats entered the population, rapidly increased, and then, by homeostatic mechanism, declined. The removal of the food supply (–F) later resulted in disappearance of rats for 3.5 years.

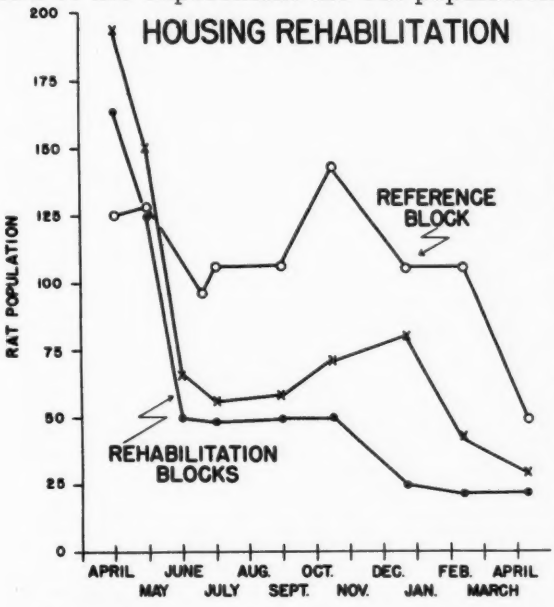

FIGURE 4 Rehabilitation of housing conditions reduced rat numbers.

Other Species

Many other rodents have been studied and, although the evidence is by no means as complete, some species such as prairie dogs are clearly vulnerable to poisons because of their habits and can be eliminated from various areas. However, changes

in habitat conditions are equally effective. Many other species, especially microtines (small mice), are not very vulnerable to poisons and many years of effort have been devoted to finding a better procedure for poisoning these species. A long-term project has been conducted since 1933 in an attempt to find a procedure that will reduce the pine mouse in its rural habitat. The history shows that poison after poison and device after device were invented only to fail to produce satisfactory results. Just recently a "promising" new poison has been again proclaimed, but it is obvious that the history of nearly four decades of poison tests will simply be repeated again. The appropriate way to reduce damage by pine mice and other microtines is to develop a means of altering the habitat condition, which usually is some agricultural situation. Research should be redirected to finding a procedure for harvesting or managing crops so that the habitat for pine mice will be reduced or eliminated.

The goals of rodent control are, of course, to reduce the damage below a level of economic interest. It usually is not necessary to eliminate the population from an area. To achieve this goal we now have adequate knowledge about the life history and population principles for the control of urban rats and perhaps for microtines of agricultural interest. The principles are available for many other species such as the bandicoot and other tropical rats. Many details are known for these species, and it would seem that control could be achieved if the proper strategy were adopted. New information can always be collected, indeed the amount of information to be obtained is infinite since local differences and yearly changes can always provide new facts. However, it seems unnecessary to obtain complete information; for example, it makes little difference whether the home range of rats is 150 square feet in one town and 175 in another. Thus, for urban rat populations in the United States it would seem unnecessary to embark on a program of obtaining local data. In other places, some new knowledge may be desirable but it should be carefully oriented to determine the local circumstances in respect to the population principles mentioned above. In all cases it should be related to the goal of manipulation of the habitat to reduce the capacity of the area to support the rodents, so that the damage will be below economic levels.

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